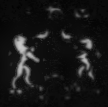
Transportation Safety Board of Canada



Bureau de la securite des transports du Canada

Aviation Occurrence Reports

Issue 10

AVIATION OCCURRENCE REPORTS

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AVIATION OCCURRENCE REPORTS

On March 29, 1990, the Canadian Transportation Accident Investigation and Safety Board took over the responsibilities of the Canadian Aviation Safety Board (CASB). The Aviation Occurence Reports contained in this issue were completed by the CASB prior to the changeover. The responsibility for making these reports public now rests with the new transportation safety board.

In accordance with the CTAISB Act, part of the Board's objective is to report publicly on its investigations, on the related findings, and on any recommendations designed to eliminate or reduce safety deficiencies.

The Aviation Occurrence Reports publication contains reports on CASB investigations, findings, and recommendations adopted by the Board and occurrence briefs. The sole intent in providing this information is to advance aviation safety. It is not the object of the Board to determine or apportion any blame or liability in connection with aviation occurrences.

This publication contains reports of aviation occurrences, in Canada, involving Canadian or foreign-registered aircraft. Anyone wanting to employ the Aviation Occurrence Reports for purposes other than advancing aviation safety could find the information incomplete.

This publication is also available in French.

A limited number of copies of this publication are retained and are available from:

Canadian Transportation Accident
Investigation and Safety Board
P.O. Box 9120 Alta Vista Terminal
Ottawa, Ontario
K1G 3T8

Cette publication est également disponible en français.

On peut obtenir des exemplaires de la présente publication en nombre limité auprès du:

Bureau canadien d'enquête sur les accidents
de transport et de la sécurité des transports
C.P. 9120 Terminus postal Alta Vista
Ottawa (Ontario)
K1G 3T8

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EXPLANATORY NOTES

TYPES OF REPORTS

The CTAISB currently produces four types of occurrence reports: there are three investigation report formats and the brief. the most common investigation report format is the summary report which summarizes the details of the investigation in one or two pages. Intermediate reports are somewhat longer and more detailed. For both these types, the complete public report is reproduced in this publication. More factual information is available on summary and intermediate reports and can be obtained by contacting the CTAISB and referencing the report number. A small number of investigations (generally 15 to 20 per year) result in International Civil Aviation Organization (ICAO) format reports. For the latter type of report, only the synopsis and the conclusions and recommendations sections of the report are included in this publication. The full report can be obtained by contacting the CTAISB and referencing the report number (which is included with the synopsis). An aviation occurrence brief is a short narrative history of the flight and occurrence. It includes pertinent information based on a report by the pilot or operator of the aircraft. Laboratory reports, if laboratory analysis has been carried out, are available for all three categories of reports and can be obtained in the same manner.

GROUPING OF REPORTS

For ease of reference, the reports in this publication are grouped by broad category of aircraft type and by type of operation within each group. the reports are then presented chronologically (by the date of the occurrence) within each subgroup.

For fixed-wing conventional aircraft, the subgroup is Public Transportation. This includes scheduled, other unit toll, and charter operations. Note that this subgroup is further divided into occurrence involving (i) aircraft of 5 700 kg (12,500 lb) or over and (ii) aircraft under 5 700 kg (12,500 lb). The second subgroup is Commercial Training. This includes licensed flying clubs and commercial specialty training (commercial licence classes 6 and 7, respectively). All other types of fixed-wing aircraft commercial operations are grouped under Other Commercial Operations. The Private Aircraft subgroup includes all privately registered aircraft, both personal and corporate. It is further subdivided according to type of landing gear. The final subgroup contains occurrences involving state-owned aircraft.

For the rotary-wing category, there are fewer aircraft and fewer occurrences. Thus, only three subgroups are used, viz. Commercial, Private, and State.

The final category contains reports and briefs for all other types. This includes amateur-built aircraft, ultralights, gliders, balloons, etc.

CONTENTS OF SUMMARY REPORTS AND INTERMEDIATE REPORTS

Information on Aircraft:

The first block of each report identifies the type of aircraft involved in the occurrence, the model, the registration, the location, and the date of the occurrence; for commercially operated aircraft, the operator is also identified.

Occurrence Report Number:

The second block commences with the occurrence report number (any queries to the CTAISB should carry this reference). The first two numbers identify the year of the occurrence, the first letter identifies the CTAISB office that conducted the investigation ('A' - Atlantic, 'Q' - Quebec, 'O' - Ontario, 'C' - Central, 'W' - Western, 'P' - Pacific, 'H' - Head Office). The first number

after the letter identifies the year of the decade of the occurrence. This block also contains information on the type of investigation (a correspondence investigation is one in which the site of the occurrence was not visited by a CTAISB investigator), the time of the occurrence, the type of operation, the extent of damage to the aircraft, and the type of licence held by the pilot.

Pilot Hours:

This block indicates the total number of hours the pilot had acquired on all types of aircraft, the total number of hours on type, and number of hours flown in the last 90 days (in total and on type).

Injuries:

The injuries sustained by the crew, passengers, or others are classified as Fatal, Serious, or Minor/None (See Definitions).

Summary Report Narrative:

The narrative summarized the history of the flight, pertinent factual information and analysis. The narrative is divided into two parts:

(a) the factual information or a description of what happened, which begins with a description of the history of the flight as close as possible to the occurrence, followed by the pertinent information; and

(b) an analysis of why the occurrence happened.

Reported Circumstances: (Briefs only)

The narrative summarizes the pertinent information based on a report by the pilot or operator of the aircraft.

Findings: (Reports only)

The Board's findings from an investigation are grouped under two subheadings as follows:

Cause-Related Findings: Any element of the occurrence, found during the investigation which, if removed, would have prevented the occurrence, or, if removed, would have avoided or reduced damage to property and people.

Other Findings: Information, discovered during the investigation of an occurrence, which is not cause related but has the potential to enhance or degrade aviation safety.

Safety Action:

For all aviation occurrence investigations, relevant data are recorded to facilitate statistical analysis and the identification of system-wide safety deficiencies through safety studies. In cases where an individual occurrence investigation leads to significant safety action being taken, that action is included in the public report immediately after the findings.

DEFINITIONS

(Extracted from the Canadian Aviation Safety Board Act/Regulations)

"AVIATION OCCURRENCE"

(a) any accident or incident associated with the operation of aircraft, and

(b) any situation or condition that the Board has reasonable grounds to believe could, if left unattended, induce an accident or incident as described in paragraph (a).

"ACCIDENT"

"ACCIDENT" means any aviation occurrence where, at any time during the period commencing when the first person boards an aircraft for the purpose of flight and ending when the last person disembarks from the aircraft after the flight,

(a) a person other than a stowaway, sustains a serious injury or fatal injury, that is not self-inflicted or inflicted by another person or caused by natural causes, as a result of that person

  i) being in the aircraft,

  ii) coming in direct contact with any part of the aircraft, including any part that may have become detached from the aircraft, or

  iii) being directly exposed to the jet blast of the aircraft,

(b) the aircraft sustains damage or structural failure adversely affecting the structural strength, performance or flight characteristics of the aircraft and normally requiring major repair or replacement of any affected component part, other than damage or failure that is limited to

  i) the engine, its cowling, or its accessories,

  ii) the propellers, wing tips, antennae, tires, brakes or fairings, or

  iii) small dents or puncture holes in the aircraft skin, or

(c) the aircraft is missing or is completely inaccessible.

"SERIOUS INJURY"

"SERIOUS INJURY" means an injury that is sustained by a person in an accident and that

(a) requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was sustained,

(b) results in a fracture of any bone, other than a simple fracture of the nose or of any fingers or toes,

(c) involves lacerations that cause severe haemorrhage or nerve, muscle or tendon damage,

(d) involves injury to any internal organ, or

(e) involves second or third degree burns, or any burns affecting more than five per cent of the body surface.

"INCIDENT"

"INCIDENT" means an aviation occurrence, other than an accident, that affects or could affect the safe operation of an aircraft. Incidents can be reported to the CTAISB through mandatory or voluntary reporting mechanisms.

According to the CTAISB regulations a "reportable incident" means any incident involving an aircraft with a maximum certified take-off weight greater than 5 700 kg where

(a) an engine fails,

(b) smoke or fire occurs, other than an engine fire that is contained within the engine and does not result in engine failure or damage to other component parts of the aircraft,

(c) difficulties in controlling the aircraft in flight are encountered due to any aircraft system malfunction, weather phenomena, wake turbulence, operations outside the approved flight envelope, or uncontrolled vibrations,

(d) the aircraft fails to remain within the intended landing or take-off area, lands with one or more landing gear retracted, or drags a wing tip or engine pod,

(e) any crew member is unable to perform his flight duties as a result of incapacitation,

(f) decompression, explosive or otherwise, occurs that necessitates an emergency descent,

(g) a fuel shortage occurs that necessitates a diversion or requires approach and landing priority at the destination of the aircraft,

(h) the aircraft is refuelled with the incorrect type of fuel or contaminated fuel that is undetected prior to departure from the ramp,

(i) a collision or risk of collision with any other aircraft or with any vehicle, terrain or obstacle occurs, including a collision or risk of collision that may be related to air traffic control procedures or equipment failures,

(j) a flight crew member declares an emergency or indicates any degree of emergency that requires priority handling by an air traffic control unit or the standing by of a crash, fire fighting or rescue services, or

(k) toxic gases or corrosive materials leak from any cargo aboard the aircraft.

RISK OF COLLISION BETWEEN:
MCDONNELL DOUGLAS DC-10
VIRGIN AIR 001 N108WA and
BOEING 747 SWISSAIR 101 H-SXIC
VICINITY OF HALIFAX, NOVA SCOTIA
05 AUGUST 1987

REPORT NUMBER: 87-A74959
LOCAL TIME: 1940 ADT
INFORMATION SOURCE: Field Investigation

MCDONNELL DOUGLAS DC-10 N108WA

OPERATOR: World Airways Inc.
OPERATION: International Scheduled
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	N/A	N/A	N/A	N/A
LAST 90 DAYS	N/A	N/A	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	N/A
PASSENGERS	-	-	N/A

BOEING 747 H-SXIC

OPERATOR: Swissair Airlines
OPERATION: International Scheduled
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	N/A	N/A	N/A	N/A
LAST 90 DAYS	N/A	N/A	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	N/A
PASSENGERS	-	-	N/A

HISTORY OF THE FLIGHT:

Swissair 101 was an eastbound flight from New York, United States to Zurich, Switzerland flying through airspace controlled by Moncton Area Control Centre (ACC). It was on a cleared track from Nantucket, Massachussetts, direct to a position near St. John's, Newfoundland. This track took the aircraft over Nova Scotia, near Halifax. Swissair 101 was at flight level (FL) 350, an altitude inappropriate for the direction of flight.

Virgin Air 001 was a westbound flight from Gatwick, United Kingdom to Newark, New Jersey, at FL350. This aircraft was also flying through airspace controlled by Moncton ACC, on a cleared track which was also near Halifax. This track would have provided 20 nautical miles separation with Swissair 101 when the aircraft passed in the vicinity of Halifax.

Virgin Air 001, while still near St. John's, requested a route change from its present position direct to Boston. The request was approved, and the new track placed Virgin Air 001 on a near collision track with Swissair 101.

As the two aircraft approached Halifax and were 35 miles apart, a controller realized the aircraft were on a potential head-on collision course. An attempt was made to contact Virgin Air 001, but the aircraft was not on the appropriate frequency. An immediate turn was requested of Swissair 101, and the two aircraft passed within three nautical miles of each other at FL350. Ten nautical miles was the required radar separation.

PERTINENT INFORMATION:

Swissair 101 was accepted by Moncton ACC, from Boston ACC, at an altitude inappropriate for the direction of flight, also known as a "wrong-way" altitude.

Directions to controllers in Moncton ACC regarding the assignment of inappropriate altitudes are contained in the Air Traffic Services Manual of Operations (MANOPS) Section 432.2, and Moncton ACC Operations Letter 015/83. These directives state that an altitude inappropriate for the direction of flight may be approved provided that the pilot requests it for icing, turbulence, or a fuel consideration. If the pilot does not state a reason, the directives state that the controller must determine the reason and get an estimate from the pilot as to when the aircraft will be able to maintain an appropriate altitude. There are procedures in the ATC MANOPS that illustrate special ways of identifying aircraft flying at inappropriate altitudes such as circling the altitude in red on the flight progress strip and by radar vectoring.

Moncton ACC initiates the use of inappropriate altitudes in the high-level airspace system because of high traffic volumes. The traffic flow across the North Atlantic, which passes through Moncton ACC airspace, is predominantly eastbound during the night and westbound during the day. During the eastbound flow, the huge volume of traffic can only be accommodated by using all available altitudes as Moncton structures the airspace to accommodate the trans-oceanic flow. When the airspace is structured, one altitude (usually FL290) is reserved for aircraft travelling against the flow.

Air carrier aircraft about to cross the North Atlantic, routinely request altitude changes as they pass through Moncton ACC airspace for operational and fuel conservation reasons. In many cases, pilots request altitudes inappropriate to the direction of flight.

Despite the requirement for a specific reason to request an inappropriate altitude, it has become routine practice at the Moncton ACC to accept high-level aircraft operating at wrong-way altitudes.

Certain air traffic handling procedures which are applied at other Canadian ACC's are waived at Moncton ACC for aircraft flying to and from the North Atlantic track structure. There is no system in place at Moncton ACC to identify an assigned altitude as being inappropriate when affecting sector-to-sector unit co-ordination.

The two aircraft were 700 miles apart and were each displayed on a different radar screen when the route change was approved for Virgin Air 001. Eventually, as Virgin Air 001 approached Swissair 101, both aircraft were on the screen of the controller who had responsibility for providing separation. This controller was also occupied in spacing high-level arrival traffic for Halifax, a procedure for which he was qualified, but for which he had little operational experience. He did not notice the impending conflict.

About three minutes before the incident occurred, this controller was relieved from his position, but, because he had forgotten about Virgin Air's inappropriate altitude, he did not brief the relieving controller about the conflict. Shortly after the controller change, the conflict was noticed by the controller manning the sector from which Virgin Air 001 was exiting.

ANALYSIS:

This incident would not have occurred if inappropriate altitudes were not used in Moncton airspace or if positive directives were in place to ensure adequate monitoring of critical opposite direction traffic. When aircraft are allowed to fly at inappropriate altitudes, it introduces an increased element of risk.

The development of sophisticated fuel management systems in modern-day airliners has given airline companies the ability to calculate the most advantageous climb schedules for fuel economy. This has increased the pressure on the ATC system to approve inappropriate altitudes for economic, rather than flight safety reasons.

At Moncton ACC, this problem of inappropriate altitudes is particularly noticeable because of the unique nature of the traffic. Both the economic pressure on long-range flights, and the need to structure the trans-oceanic traffic flow, augment the problem. Most controllers are of the opinion that the trans-oceanic traffic flow would have to be restricted without the free use of inappropriate altitudes. ATC management did not discourage this practice.

The requirement to red circle the data strips for aircraft at inappropriate altitudes was waived at Moncton ACC because so many aircraft were being approved that the red circle did not serve its original purpose, which was to highlight unusual aircraft.

Radar vectoring is used to separate aircraft at inappropriate altitudes. The progress of aircraft cleared directly to navigation aids or geographical fixes is monitored on radar by controllers.

It could not be determined why Virgin Air 001 was not on the appropriate frequency just before the occurrence, but the aircraft was eventually contacted on the frequency appropriate to the next segment of its track. It appears that the crew changed frequencies early.

The radar controller, in whose sector the conflict was developing, forgot about the two aircraft proceeding head-on. At the time, he was engrossed in the spacing and speed control problems at Halifax. This no doubt contributed to his forgetfulness because of his need to concentrate on, what was to him, a new control function.

The controller's concept of the traffic situation was also hindered because Virgin Air 001 was not on the controller's radar screen when the route change was approved and the conflict developed. Had it been, it would have assisted him in obtaining an immediate picture of the potential conflict.

In addition, there is no formal procedure requiring the data controller to ensure that potential conflicts are being resolved by the radar controller.

Another complication arises with the approval of direct routes, where aircraft are allowed to fly off airways, and controllers no longer enjoy the structure of fixed routes and the anticipation of tracks provided by them. When this occurs, it is more difficult for the controller to develop a mental picture of the traffic and harder to visualize potential conflicts.

If inappropriate altitudes are going to be assigned in the high-level airspace structure, as it appears they must, then the increased risk must be recognized and positive directives must be in place to ensure that these critical situations are properly monitored.

CONCLUSIONS:

Findings:
1. Swissair 101 was cleared at an altitude inappropriate to the direction of flight.

2. Use of inappropriate altitudes increases the potential for loss of separation.

3. Use of inappropriate altitudes was permitted by managers at Moncton ACC and was viewed as a routine operation by most controllers.

4. When the conflict between the two aircraft was initially set up, the aircraft were on separate radar screens.

5. The controller who was responsible for the separation of the two aircraft was preoccupied with other traffic and forgot about Virgin Air 001.

6. The resolution of the problem was delayed because Virgin Air 001 was not on the appropriate frequency.

Causes:
Swissair 101 was accepted at an altitude inappropriate to the direction of flight, which set up a conflict with Virgin Air 001. The controller who had responsibility for providing radar separation was pre-occupied with other traffic and, because a stringent monitoring system was not in place, he forgot about Virgin Air 001.

SAFETY ACTION:

Action Taken:
Evaluation studies conducted by Transport Canada between December 1985 and August 1987 suggest that inconsistent application of ATC directives is a nationwide problem, not confined to a specific geographic area. Regardless of the reasons for any such non-compliance with established directives and procedures, this near collision clearly demonstrated that safety margins can be dangerously eroded when established procedures are not complied with. Therefore, the CASB suggested that Transport Canada undertake a review of the operational requirements and the essential safety constraints required for the assignment of inappropriate altitudes to IFR aircraft for their direction of flight.

In its reply, Transport Canada stated that the ATS system cannot function without the ability to use inappropriate altitudes to direction of flight. It enables ATC to address the volume and complexity of traffic to and from international airspace and the volume of traffic between selected city pairs which dictates the use of one-way traffic flows.

The stringent conditions under which controllers can assign altitudes inappropriate to the direction of flight are specified in section 432 of the Air Traffic Control Manual of Operations (TP703).

Measures have been taken since this incident to ensure a high level of awareness and compliance with this standard. These include memoranda to Regional Managers and an issue of the ATS Safety Bulletin devoted to the subject.

The operations direction to controllers in both Moncton and Gander Area Control Centres has been revised to ensure that, when airspace is structured, an altitude appropriate to direction of flight is kept open for traffic operating against the main flow.

The assignment of altitudes inappropriate to direction of flight has been the subject of lengthy consideration and evaluation within Transport Canada Aviation Group. A formal recurring review process will now be established to ascertain the justifications for the use of 'wrong-way' altitudes.

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RISK OF COLLISION BETWEEN: BOEING 747-136 G-BDPV and MCDONNELL DOUGLAS DC-10 SN261 ALERT, NORTHWEST TERRITORIES 60 mi W 09 OCTOBER 1987

REPORT NUMBER: 87-W74102
LOCAL TIME: 1709 UTC
INFORMATION SOURCE: Office Investigation

BOEING 747-136 SPEEDBIRD FIVE G-BDPV

OPERATOR: British Airways
OPERATION: Scheduled International
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	11,000	2,500	N/A	N/A
LAST 90 DAYS	200	200	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	N/A
PASSENGERS	-	-	N/A

MCDONNELL DOUGLAS DC-10 SN261

OPERATOR: Sabena
OPERATION: Scheduled International
DAMAGE: None
PILOT: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	N/A	N/A	N/A	N/A
LAST 90 DAYS	N/A	N/A	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	N/A
PASSENGERS	-	-	N/A

HISTORY OF THE FLIGHT:

The Edmonton Area Control Centre (ACC) was expecting two aircraft to pass over Alert, Northwest Territories, at approximately 1700 Coordinated Universal Time (UTC). One was a British Airways Boeing 747, Speedbird Five, out of London, England en route to Anchorage, Alaska via Polar Route Three to Alert, Arctic Track Quebec to Anchorage at flight level 350 (FL350). The second was a Sabena DC-10, SN261, out of Brussels, Belgium, also en route to Anchorage, Alaska via Polar Route Seven to Alert, Arctic Track Quebec to Anchorage at FL310.

At 1659 UTC, SN261 reported having passed Alert at 1658 UTC, at FL310 and requested FL350. At 1701 UTC, Edmonton Centre cleared SN261 to maintain FL330, stating they were unable to approve FL350 due to traffic. At 1703 UTC, SN261 reported reaching FL330. Also at 1703 UTC, Speedbird Five reported having passed Alert at 1700 UTC at FL330. SN261 was then recleared down to FL310.

PERTINENT INFORMATION:

At 1631 UTC, Speedbird Five had requested clearance from the Reykjavik ACC through Gufunes Communications Centre to climb from FL330 to FL350. Reykjavik called Edmonton Centre to pass Speedbird Five's estimate for Alert and the request for FL350. Edmonton approved FL350 and stated, "I'll show it." Edmonton was then expecting Speedbird Five to arrive over Alert at FL350.

At 1635 UTC, Reykjavik instructed Gufunes Communications Centre to clear Speedbird Five to FL350. Between 1638 and 1647 UTC, Gufunes attempted to contact Speedbird Five 15 times but received no reply and, at 1647 UTC, advised Reykjavik of the problem. This report did not reach the attention of the appropriate Reykjavik sector controller, and, consequently, Edmonton was not informed that Speedbird Five was still at FL330.

The Gufunes Communication Centre is required to notify Reykjavik ACC if a clearance is not delivered within five minutes of receipt. This notification appears on a video display.

The sectorization of Reykjavik ACC is organized according to the volume of air traffic. At the time, there were four oceanic sectors in operation:

Sector 1 controlling traffic at FL 350 and above,
Sector 2 controlling traffic at FL 330,
Sector 3 controlling traffic at FL 310,
Sector 4 controlling traffic at FL 290 and below.

Both aircraft were out of very high frequency (VHF) coverage after 1630 UTC. High frequency (HF) communications were reported as being good with very heavy traffic on all frequencies.

ANALYSIS:

The inability of the Gufunes Communication Centre to contact Speedbird Five and pass the clearance to climb to FL350 was due to heavy traffic congestion on all HF frequencies. The Sector 2 controller in the Reykjavik ACC was unaware that the clearance had not been passed to Speedbird Five as the ACC attempted to contact the aircraft for nine minutes without notifiying the controller that he was having difficulty. The controller would normally expect to be informed of any communciation difficulty within five minutes of issuing the clearance. The use of a video display to notify the controller that the clearance has not been passed does not attract the attention of the controller as readily as would a verbal notification. As a result, Edmonton ACC was not informed that Speedbird Five was still at FL330.

The Edmonton controller had coordinated with the Reykjavik controller that Speedbird Five would enter Canadian airspace at FL350. However, he had not requested that a climbing restriction be imposed on the flight, and he did not ascertain that the aircraft had vacated FL330 before clearing Sabena SN261 to that level after Alert, and a loss of separation ensued.

CONCLUSIONS:

Findings:
1. Speedbird Five had requested a change of altitude from FL330 to FL350 approximately 30 minutes before leaving the Reykjavik Control Area.

2. Heavy radio traffic prevented the Gufunes Communications Centre from relaying the climb clearance to Speedbird Five.

3. The Gufunes Communications Centre did not notify the Reykjavik ACC that the clearance had not been passed after the required maximum time of five minutes had elapsed.

4. When the Communications Centre did notify the ACC that the clearance had not been passed, it did so via a video display screen, according to normal practice, which was not noticed by the sector controller.

5. Speedbird Five entered the Edmonton Control Area at FL330 with a longitudinal spacing of two minutes, behind SN261.

6. Sabena 261 was cleared to climb from FL310 to FL330 while it was less than ten miles ahead of Speedbird Five.

Causes:
Because of a communication breakdown between the Gufunes Communication Centre and the Reikjavik controller, the controller was unaware that the clearance he had issued for Speedbird Five to climb to FL350 had not been transmitted to the flight, and Edmonton ACC was not notified that the flight would be entering its airspace at FL330 instead of FL350. The Edmonton controller did not ascertain that Speedbird Five had vacated FL330 before clearing Sabena 261 to that level.

SAFETY ACTION:

Action Taken:
The ongoing Canadian Aviation Safety Board Special Investigation into Air Traffic Services is examining safety issues in oceanic airspace, such as the adequacy of HF communications and the airspace structure.

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AERON INTERNATIONAL AIRLINES INC.
CANADAIR CL44 N122AE
GANDER, NEWFOUNDLAND
12 NOVEMBER 1987

REPORT NUMBER: 87-A74991 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1600 NST
OPERATION: International Charter
DAMAGE: Nil
PILOT LICENCE: Airline Transport (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	8,000	4,300
LAST 90 DAYS	280	280

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	3
PASSENGERS	-	-	3

SUMMARY REPORT:

The aircraft was in cruise flight en route from Kennedy, New York to Manston, England, when the number four engine fire warning activated. The captain shut down the engine and discharged the fire extinguisher. An emergency was declared, and the aircraft diverted to Gander, Newfoundland and landed without further incident.

When the fire warning activated, there was also an indication of oil breather overheating, high tailpipe gas temperature compared to the power setting, and the generator was tripping off line.

Initial investigation revealed that an electrical wire bundle in the number four engine nacelle apparently had a short circuit and had burned. The aircraft was ferried on three engines to Hagerstown, Maryland for maintenance repairs.

At Hagerstown, it was determined that there was a short circuit in the propeller de-ice circuit to the number four propeller. The short caused overheating and burning in the wire bundle and resulted in false engine indications. Because of the proximity of the hot wire bundle to the tailpipe fire warning wire, the fire warning was activated.

CONCLUSIONS:

Findings:
1. There was a short circuit in the number four propeller de-ice circuit, causing the circuit wire and wire bundle to overheat.

2. The tailpipe fire warning activated because the warning wire was exposed to the heat from the burning wire bundle.

Causes:
The overheated propeller de-ice wire caused adjacent wires in the wire bundle to burn, resulting in false indications.

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INTERFLUG (EAST GERMAN AIRLINES)
ILYUSHIN IL-62M DDR-SEU
GANDER, NEWFOUNDLAND
15 NOVEMBER 1987

REPORT NUMBER: 87-A74992 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1711 NST
OPERATION: Scheduled International
DAMAGE: Minor
PILOT LICENCE: Airline Transport (German Democratic Republic)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	N/A	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	10
PASSENGERS	-	-	125

SUMMARY REPORT:

The aircraft was landing at night on runway 04 in Gander, Newfoundland after a flight from Havana, Cuba. Visibility was restricted in snow and blowing snow, and there was a cross-wind from the left. After touchdown, the aircraft departed the right-hand side of the runway and tracked beside it for about 1,300 feet before regaining the runway. Damage to the aircraft was limited to superficial scratches and dents. Three runway side marker lights were broken.

While the aircraft was on approach, Gander Tower reported that the wind was from 350 degrees at 22 knots, the runway visual range (RVR) on runway 04 was 3,500 feet, and the James Brake Index (JBI) was decimal 4. For this cross-wind component, company policy required a minimum RVR of 4,000 feet for the crew to continue the approach.

During the approach, the airspeed was consistently 10 to 15 kilometres per hour (km/h) higher than the calculated target speed. At an altitude of 200 feet above ground level (agl), 3,000 feet from the threshold, the rate of descent increased to greater than 20 feet per second, and the aircraft descended below the glide slope. Power was applied to correct the rate of descent, and this, combined with the high rate of descent, caused the airspeed to increase. The aircraft crossed the threshold at 315 km/h, which was 15 to 20 km/h faster than the target speed.

The aircraft was flared for landing about 1,000 feet beyond the threshold. After the flare, the aircraft began to drift to the right, and it touched down to the right of the runway centre line, 2,100 feet from the threshold. The touchdown speed was 295 km/h, 42 km/h above the target speed. The crew immediately applied full left rudder, but this did not stop the drift.

Because of the cross-wind, the crew was maintaining a higher than normal airspeed on approach. When the correction was made for the high rate of descent at 200 feet agl, the approach became unstable, and the target speeds for flare and touchdown were missed. Because of the darkness and the blowing snow, the crew did not notice that the aircraft was drifting to the right until after it had touched down. With the slippery runway conditions, and the aircraft light on its wheels because of the high landing speed, braking action was reduced, and the drift could not be eliminated before the aircraft left the runway.

CONCLUSIONS:

Findings:
1. The aircraft was landed at night on a slippery runway, with a strong cross-wind, and with reduced visibility in snow and blowing snow.

2. The RVR on runway 04 was 500 feet below the limits prescribed by the company for a cross-wind landing.

3. The approach was flown at a higher than normal airspeed and became unstable after descent through 200 feet agl.

4. After the flare, the crew did not recognize that the aircraft was drifting to the right.

5. The speed at touchdown was 42 km/h faster than the target speed, which made the aircraft light on its wheels.

Causes:
The crew was unable to maintain directional control while landing in visibility conditions slightly below prescribed company limits for cross-wind landings.

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INTERLAKE AVIATION LIMITED
CESSNA 150J C-GYIH
PORTAGE LA PRAIRIE, MANITOBA 12 mi N
11 FEBRUARY 1988

REPORT NUMBER: 88-C0029 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2030 CST
OPERATION: Flying Club Training
DAMAGE: Minor
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	250	33
LAST 90 DAYS	40	33

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was conducting a solo night training exercise and had been airborne for approximately three hours when he was recalled because of increasing winds at home base. As the pilot turned the aircraft and advanced the throttle, the engine coughed and lost all power, and the propellers stopped. The pilot attempted two re-starts without success, then conducted a forced landing in a field. After landing, the pilot was able to re-start the engine. He ran the engine at 1000 rpm for about an hour and a half in order to keep warm. He then shut the engine down and proceeded to an abandoned farm house. A combined air/ground search located and rescued the pilot five hours after the incident. His feet were severely frostbitten.

The engine and accessories were examined, and no discrepancies were found. The fuel system was serviceable and was delivering clean fuel. The flaps were inoperative and were placarded as such. A kit for cold weather operations had been partially installed.

The pilot had been flying at 4,000 feet above sea level with the engine at 2300 rpm and the mixture leaned. The outside air temperature was approximately –26 degrees Celsius. The temperature and humidity conditions were not conducive to carburettor icing. When the engine stopped, the pilot placed the mixture to rich and advanced the throttle. This same situation had occurred twice the previous day, under similiar circumstances; that is, the engine stopped following a throttle movement after a long flight at constant rpm and at very low ambient temperatures.

The carburettor meters fuel in proportion to the volume of air passing through the venturi, to establish a fuel/air ratio that is within combustible tolerances. The volume of air is not changed with differing conditions of air density and remains constant while the density varies due to temperature or altitude. The carburettor installed on this aircraft was not auto-sensitive to changes in the density of air and may have failed to supply an ignitable fuel/air mixture or may have supplied a very lean mixture at low altitude when air density was increased due to the extremely low temperatures of the air.

The pilot declared an emergency after the engine stopped, which initiated search procedures. He turned on the emergency locator transmitter (ELT) after landing but did not extend the antennae. The pilot had not received instructions on the proper use of the ELT nor on the proper procedures to take following a forced landing. The pilot was not suitably dressed for winter flying operations and nearly succumbed to the bitterly cold weather before being rescued.

The reason for the power loss could not be determined; however, it is possible that the relatively low altitude of the aircraft and the very cold ambient air resulted in a fuel/air mixture that was extremely lean and sensitive to throttle movements. When the pilot advanced the throttle to return to base, a surge of air passed into the carburettor resulting in a fuel/air mixture that would not support combustion.

CONCLUSIONS:

Findings:
1. The engine lost all power after the throttle was advanced.

2. The pilot conducted a successful forced landing at night.

3. The pilot was flying at a relatively low altitude and in very low ambient air temperatures, which probably resulted in a lean fuel/air mixture.

4. The flaps were inoperative.

5. The pilot was improperly dressed for winter flying.

6. The pilot had not been trained in ELT or after forced-landing procedures.

Causes:
The engine lost all power, most probably as a result of a lean fuel/air mixture.

AIR CANADA
BOEING 747 C-FTOD
NORTH ATLANTIC 54°0'N 43°0'W
26 JULY 1987

BRIEF NUMBER: 87-A74077 (Incident)
LOCAL TIME: 0540 UTC
OPERATION: Scheduled International
DAMAGE: Nil
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	18,517	N/A
LAST 90 DAYS	106	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	16
PASSENGERS	-	-	419

REPORTED CIRCUMSTANCES:

The number one engine flamed out while the aircraft was in cruise flight. The pilot was unable to restart the engine, so the engine was shut down. Maintenance personnel determined that the high-pressure fuel pump had failed; the HP fuel pump and the fuel control unit were replaced.

Engineering Memorandum No. 3-6273-00 from Air Canada advises that the fuel pump failed as a result of looseness developing in the clamp assembly which secures the pump to the gear box. This caused excessive drive shaft spline wear. A fleet-wide campaign was initiated for inspection of all B747 and B767 aircraft engines having similar fuel pumps. Any pumps found loose were to be scheduled for removal and corrective action as required.

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AIR ONTARIO LTD.
HAWKER SIDDELEY H.S. 748-2A C-GGNZ
TORONTO/LESTER B. PEARSON
INTERNATIONAL AIRPORT, ONTARIO
10 AUGUST 1987

REPORT NUMBER: 87-O/74172 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0810 EDT
OPERATION: Scheduled Domestic
DAMAGE: Minor
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	9,000	5,000
LAST 90 DAYS	70	70

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	4
PASSENGERS	-	-	37

HISTORY OF THE FLIGHT:

After landing from a regularly scheduled passenger flight, the aircraft was assigned to Gate 82B, Terminal Two. Upon arrival at the gate, the ramp marshaller waved the aircraft over to Gate 86. The aircraft turned from Gate 82B and taxied to Gate 86. As the aircraft made a right turn into Gate 86, the left wing tip struck a tree at the edge of the apron, causing minor damage to the leading edge of the left wing tip.

PERTINENT INFORMATION:

There was a yellow guideline to Gate 86 painted on the ramp, and the tree that the wing struck was 71 feet 8 inches from the yellow guideline. The wing span of the Hawker Siddeley H.S. 748 is 98 feet 6 inches; therefore, there was adequate clearance for this aircraft at Gate 86 if it had followed the guideline. However, the normal procedure of following the guideline and nosing the aircraft into the gate was not being used at Gate 86; instead, the aircraft were being marshalled so that they were operating close to the edge of the apron, in order to turn around in the gate to face nose out, thus eliminating the need for a push-back on departure.

Aircraft usually approached Gate 86 in such a way as to be able to taxi straight into the gate and monoeuvre close enough to the edge of the apron to turn around at the gate. It was reported to be common for an aircraft's wing tip to touch the outer branches of the tree as the aircraft manoeuvred at the gate.

ANALYSIS:

The last minute change in gate allocation resulted in the H.S. 748 approaching Gate 86 at an angle. The turn into the gate was made too close to the edge of the apron, and this put the left wing tip too far over the edge of the apron and resulted in the wing tip striking the tree as the turn was made.

FINDINGS:

Cause Related:
1. The normal procedure of following the guideline and nosing the aircraft into the gate was not being used.

2. The turn into the gate was made too close to the edge of the apron, and the wing tip struck a tree.

3. A wing marshaller was not used.

Other:
-Nil-

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AIR ATLANTIC
DE HAVILLAND DHC-8 C-GTBU
MONCTON AIRPORT, NEW BRUNSWICK
19 AUGUST 1987

REPORT NUMBER: 87-A74088
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1702 ADT
OPERATION: Scheduled Domestic
DAMAGE: Minor
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	7,800	1,000	7,600	350
LAST 90 DAYS	180	180	150	150

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	3
PASSENGERS	-	-	30

HISTORY OF THE FLIGHT:

The aircraft was on a visual approach to runway 29. On short final, the captain called for 35 degrees of flap, reduced power to just above idle, and flared for landing. The aircraft bounced, and the captain held the aircraft in a nose-high attitude during the recovery; he then completed the landing, during which the tail skid struck the runway, and taxied the aircraft to the ramp without any further problem.

PERTINENT INFORMATION:

On the DHC-8 aircraft, the pilot can select either 15 or 35 degrees of flap for landing, with the throttles at flight idle. The operator encouraged their pilots to use 15 degrees of flap for landing unless runway length dictated otherwise; however, this was not a formal written company policy. The Pilot's Operating Manual for the DHC-8 stated that the nosewheel should be brought into contact with the ground promptly after the main wheels touched down.

The Flight Crew Training Manual for the DHC-8 states: "maintain 1.3 V/stall accurately until commencement of the flare, then retard the power levers smoothly to flight idle as you commence the flare, and rotate the aircraft to touch down on the main wheels. At a neutral C of G during flare, coordinate rate of control movement with rate of power reduction. Do not chop power or an immediate drop will occur."

Many DHC-8 pilots have reported that they like to carry some power after the flare when using 35 degrees of flap. They believe that, otherwise, the aircraft will stall abruptly with such a large flap setting at idle power, and this will result in a hard landing.

The digital flight data recorder of the occurrence aircraft indicated that the airspeed was correct on the approach; the captain reduced power just before the flare, and the aircraft was in a five-degree nose-up attitude just before touchdown. A nose-up elevator input of seven degrees occurred in the last second before touchdown, resulting in a rapid nose-up attitude change during touchdown. After the bounce, the elevator angle was reduced slightly, then increased to 18 degrees, and the tail skid struck the runway with the aircraft in a nose-up attitude of approximately nine degrees; the aircraft remained on the runway for six seconds. Normally, a nose-up attitude of 10 degrees will cause a tail strike, but this can occur at 8.5 degrees under some circumstances.

The co-pilot was not wearing a head-set, and the cockpit area microphone pick-up for the cockpit voice recorder did not produce a satisfactory recording of his voice. The captain was wearing a head-set, which produced an excellent reproduction of his voice.

ANALYSIS:

At touchdown, the captain was continuing to increase the angle of attack which increased lift and caused the aircraft to bounce. The reason for the elevator input at the last second could not be determined. Both pilots felt the approach to landing was normal. When the captain reduced power just before the flare, it is possible that the aircraft started to drop, which made the elevator input necessary for correction.

The elevator input after the bounce was a conscious attempt by the captain to cushion the second touchdown. When holding the aircraft off, the aircraft was put in a higher than normal nose-up attitude, causing the tail skid to strike the ground.

The power is normally set to flight idle after the flare; however, holding power after the flare and on touchdown is an acceptable alternative procedure. However, if power is used after the flare, this can cause an excessive nose-up attitude and result in a tail strike, especially if a smooth landing is attempted.

CONCLUSIONS:

Findings:

1. The captain continued to increase the angle of attack during the first touchdown, increasing the lift and causing the aircraft to bounce.

2. The captain put the aircraft in an excessively high nose-up attitude while holding the aircraft off the runway before the second touchdown, which caused the tail skid to strike the runway.

3. The co-pilot was not wearing a head-set, and the area microphone did not make a satisfactory recording of his voice.

Causes:

The landing technique used by the captain caused the aircraft to bounce on touchdown. The captain's attempt to cushion the second touchdown resulted in an excessively high nose-up attitude and the subsequent tail strike.

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RISK OF COLLISION BETWEEN: BRITISH AEROSPACE 3112 JETSTREAM 31 C-GJPH and CESSNA 172 C-GJHD LONDON AIRPORT, ONTARIO 28 SEPTEMBER 1987

REPORT NUMBER: 87-O/74207
LOCAL TIME: 1828 EDT
INFORMATION SOURCE: Field Investigation

BRITISH AEROSPACE 3112 JETSTREAM 31 C-GJPH

OPERATOR: Ontario Express Ltd.
OPERATION: Regular Specific Point
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	10,500	120	2,200	185
LAST 90 DAYS	120	120	185	185

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	11

CESSNA 172 C-GJHD

OPERATION: Private Company Business
DAMAGE: None
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,000	800
LAST 90 DAYS	150	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The crew of a Jetstream 31 was on an instrument flight rules (IFR) flight from Toronto, Ontario to London, Ontario and was cleared to fly an approach to runway 15 at London Airport in visual meteorological conditions (VMC). The crew established radio contact with the London Tower Controller when the aircraft was between four and six miles back from the airport and was instructed to report turning final for the runway. When the crew reported on final, the tower controller scanned runway 15/33, advised the crew of a visual flight rules (VFR) aircraft overshooting runway 27, and cleared them to land. The crew continued the approach until, at

an altitude of about 200 feet above ground level (agl), they observed a stationary Cessna 172 about half-way down the runway. The crew carried out an overshoot and was then cleared for a visual left-hand circuit. The tower controller instructed the Cessna 172 to taxi clear of the runway, and the Jetstream 31 landed.

PERTINENT INFORMATION:

The instrument landing system (ILS) for runway 15 had been flight-checked before the Jetstream 31 arrived, and technicians were completing system ground checks from a vehicle operating on the runway. The technicians were in communication with the ground controller who was clearing them onto and off the runway.

The tower controller had been on duty for about three and one-half hours prior to the incident. He took over the air position at about 1800 eastern daylight time (EDT) and decided to prepare and eat his evening meal while working in that position. The air traffic was light at the time; however, by the time his meal was prepared, there were three VFR aircraft in a left-hand circuit for runway 27, one aircraft in position on runway 15, departing VFR to Brantford, Ontario, and two IFR aircraft inbound from Toronto for approaches to runway 15.

About one minute before the Jetstream 31 crew contacted the control tower, the tower controller cleared the pilot of the Cessna 172 to position on runway 15 when the pilot requested his VFR take-off clearance. The technicians, who were still doing their checks, were instructed by the ground controller to clear the runway. The tower controller then became occupied controlling the other air traffic and forgot to issue a take-off clearance to the Cessna 172. From the location where the tower controller ate his meal, a mullion in the window of the control tower obscured part of runway 15/33, abeam of the Delta taxiway, where the Cessna 172 had taxied to position.

The ground controller was occupied controlling the ground traffic and coordinating IFR departure clearances for two aircraft and did not scan the runway prior to the incident. Scanning the runway is not a requirement of the ground controller.

ANALYSIS:

The coordination of IFR and VFR aircraft operating on two runways significantly increased the tower controller's workload just as he began to eat his meal, an activity which distracted him from his duties. In addition, while he ate his meal, he remained in one position and could not see the Cessna 172 when he scanned the runway prior to issuing a landing clearance to the Jetstream 31. Had he been moving around while he was scanning the runway, he would have been able to see that there was an aircraft still on the runway.

CONCLUSIONS:

Findings:

1. The tower controller did not ensure that the runway was clear before issuing a landing clearance to the Jetstream 31 aircraft.

2. The tower controller was eating his meal, which distracted him during a period of increased air traffic activity at the airport.

3. The controller forgot to issue a take-off clearance to the Cessna 172 and subsequently forgot that the Cessna 172 was on the runway.

Causes:

The tower controller was eating his meal which distracted him from his duties, and he did not adequately monitor the traffic situation at the airport nor properly scan the runway to ensure that it was clear of traffic before issuing landing clearance to another aircraft.

SAFETY ACTION:

Action Taken:

In the Report on a Special Investigation into the Risk of Collisions Involving Aircraft on or near the Ground (August 1987), the Canadian Aviation Safety Board (CASB) determined that a key to collision avoidance was an awareness and clear view of the evolving situation. As such, the CASB forwarded recommendations to Transport Canada seeking a reduction to the restrictions to line-of-sight visibility from control towers and flight service stations, an augmentation of efforts to teach and foster effective scanning techniques, and the initiation of a study into effective means of sustaining vigilance (CASB 87-17, 87-18, 87-41 respectively).

RISK OF COLLISION BETWEEN:
DE HAVILLAND DHC-7 DASH 7 C-GXPO and
CESSNA 414 C-GVZE
PRINCETON, BRITISH COLUMBIA 4 mi W
29 SEPTEMBER 1987

REPORT NUMBER: 87-P74107
LOCAL TIME: 1830 PDT
INFORMATION SOURCE: Field Investigation

DE HAVILLAND DHC-7 C-GXPO

OPERATOR: Air B.C.
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	12,100	3,100	4,900	175
LAST 90 DAYS	206	206	225	175

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	4
PASSENGERS	-	-	18

CESSNA 414 C-GVZE

OPERATION: Private Recreational
DAMAGE: None
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,081	310
LAST 90 DAYS	60	60

HISTORY OF THE FLIGHT:

The Cessna 414 departed Penticton, British Columbia for an instrument flight rules (IFR) flight at 14,000 feet via Princeton and airway V300 to Campbell River, British Columbia. The air traffic control (ATC) radar controller identified the aircraft on radar in the vicinity of Princeton as it climbed through 8,800 feet.

The DHC-7, destined for Penticton and cruising at 15,000 feet, was approaching Princeton from the west on airway V342. The pilot requested and received an ATC clearance to descend to 12,000 feet. While the aircraft was descending through 13,800 feet, in cloud, the radar controller advised the pilot of the approaching Cessna aircraft that was climbing to 14,000 feet. The pilot continued to descend, and, as he passed through 12,800 feet, he sighted the Cessna, 500 to 1,000 feet below, travelling in the opposite direction.

PERTINENT INFORMATION:

At the time of the occurrence, the Cessna was clear of cloud and the DHC-7 was breaking out of the bottom of a layer based at 13,000 feet.

The pilots and the ATC controllers were licensed and qualified. The two controllers were working the Kamloops Sector. The radar controller was responsible for providing radar and/or vertical separation between the aircraft and for ensuring an orderly traffic flow. The data controller was responsible for the provision of non-radar separation between aircraft until radio contact could be established with the involved aircraft, and for the coordination of traffic flow between adjacent ATC sectors and units. When his duties permitted, the data controller was to monitor sector traffic and advise the radar controller of any conflicts.

At the time of the occurrence, the Kamloops radar system had a history of not displaying all radar targets on each sweep of the antenna. In accordance with their operations manual, controllers are permitted to provide radar control service provided they are satisfied the radar-displayed information is adequate. If the radar information is considered unreliable, a greater distance interval between aircraft is to be established and procedures designed for a non-radar environment are to be instituted.

The controllers had been busy earlier; however, traffic was light at the time of the occurrence. The radar controller was monitoring the aircraft on radar, and the data controller was away from his position, involved in a telephone conversation. The radar controller was aware of the routes being followed by both aircraft, and both aircraft had been identified on the radar scope. Both aircraft were equipped with a transponder and encoding altimeter; however, ATC was not receiving altitude information from the Cessna. After the incident, the radar controller said that he was not sure that the Cessna's radar target was on his scope when he authorized the DHC-7 to descend.

ANALYSIS:

When the radar controller cleared the DHC-7 aircraft to descend to 12,000 feet, the Cessna was still climbing to 14,000 feet. The controller was unable to explain why he issued the clearance that resulted in the loss of separation, although he may have been distracted by the data controller's telephone conversation. He was also unable to recall whether the targets of both aircraft were being displayed on the radar when he issued the clearance to the DHC-7. The Cessna's target may have been missing because of the problem with the Kamloops radar system. He was aware that the aircraft were approaching

each other and that their separation was predicated on the difference in their assigned altitudes. When he realized that the aircraft would pass with less than the required 1,000-foot vertical separation, he warned the DHC-7 pilot of the approaching Cessna. The data controller may have detected the conflict had he been monitoring the traffic; however, because the traffic was light, he had taken the opportunity to use the telephone.

CONCLUSIONS:

Findings:

1. The radar controller cleared the DHC-7 to descend through an altitude assigned to another aircraft.

2. The radar controller did not detect the impending loss of separation until it was unavoidable.

3. The radar controller did not monitor the radar presentation effectively nor his data board before issuing descent clearance to the DHC-7.

4. The data controller was having a private conversation on the telephone and did not assist the radar controller in the monitoring of the radar presentation.

Causes:

The radar controller did not adequately monitor his radar presentations and issued an air traffic control clearance that did not ensure separation of opposite direction aircraft. Neither controller on duty detected the impending loss of separation until it was unavoidable.

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AIR ONTARIO LIMITED
DE HAVILLAND DHC-8 C-GJIG
KAPUSKASING, ONTARIO 10 mi SE
07 OCTOBER 1987

REPORT NUMBER: 87-O/74219 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 0700 EDT
OPERATION: Scheduled Domestic
DAMAGE: Nil
PILOT LICENCE: Airline Transport
PILOT HOURS:

	CAPTAIN		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	13,000	175	N/A	N/A
LAST 90 DAYS	200	175	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	3
PASSENGERS	-	-	10

HISTORY OF THE FLIGHT:

The aircraft was on a flight from Kapuskasing to Timmins, Ontario from where it had departed earlier in the morning. Approximately five minutes after take-off from Kapuskasing Airport, the left engine (Pratt & Whitney PW120A) suddenly lost power. The crew immediately shut the engine down and returned to Kapuskasing without further incident.

PERTINENT INFORMATION:

The aircraft was in a hangar overnight at Timmins Airport and had been taken out and parked on the ramp for loading shortly after 0500 eastern daylight time (EDT). During the loading period the engine intakes were not protected with plugs, and wet snow was falling. Before the aircraft left the ramp, at approximately 0530 EDT, the wing and tail surfaces were de-iced. The engine intake areas were not inspected.

The crew waited 25 minutes for flight clearance, and, during this time, snow continued to fall. At about 0600 EDT, the aircraft departed Timmins for Kapuskasing; the flight was uneventful, and the aircraft landed about 0625 EDT.

During the aircraft's 25-minute stopover at Kapuskasing, wet snow was falling. Prior to departure, the pilots did a walkaround inspection during which the engine intake areas were not inspected, and the aircraft departed

Kapuskasing at approximately 0650 EDT for the return trip to Timmins.

About five minutes after take-off, while the aircraft was climbing through 7,000 feet at 150 knots and between cloud layers, the left engine suddenly lost power. The captain reported that the left engine torque indication decreased to zero, and he observed the turbine inlet temperature (T.I.T.) falling through 411 degrees Celsius. The captain shut the left engine down and returned to Kapuskasing, where a successful single-engine landing was carried out without further incident.

Inspection of the engine intake areas of both nacelles after the landing revealed what the captain described as "considerable ice" accumulation in the inlet areas. The ice was removed, and the crew carried out a full run-up of the left engine at which time it produced full power; the aircraft was then ferried to London where a borescope inspection of the compressor and turbine section showed the engine to be undamaged, and the aircraft was returned to service.

Prior to take off and at the time of the occurrence, the engine intake anti-ice was selected on and the engine bypass doors were open. The aircraft airframe de-icing system had not been activated, and the engine ignition switches were in the NORMAL position. The latest revision of the aircraft operating manual for DHC-8 aircraft states that the ignition switch must be selected to the MANUAL position, which provides continuous ignition, when operating below 1,500 feet above ground level (agl) in any storm cloud formation and in conditions of turbulence, icing, or heavy precipitation. A further note defines icing conditions as follows:

"Icing conditions exist when the static air temperature (SAT) on the ground and for take-off is 10 degrees Celsius or below, or SAT in flight is 5 degrees Celsius or below, and visible moisture in any form is present (such as clouds, fog with visibility of one mile or less, rain, snow, sleet, or ice crystals)."

"Icing conditions also exist when the SAT on the ground and for take-off is 10 degrees Celsius or below when operating on ramps, taxiways or runways where surface snow, ice, standing water, or slush may be ingested by the engines or freeze on engine, nacelles or engine sensor probes."

Icing conditions such as those described above existed at Timmins prior to, and during, the flight to Kapuskasing and at Kapuskasing. The weather report at Timmins for 0600 EDT was as follows: precipitation ceiling 300 feet, sky obscured, visibility five-eighths mile in light snow, temperature zero degrees Celsius, dew point two degrees Celsius, wind 340 degrees magnetic at 13 knots, altimeter 29.70 inches; at Kapuskasing for 0700 EDT, precipitation ceiling 900 feet, sky obscured, visibility two miles in light snow, temperature zero degrees Celsius, dew point two degrees Celsius, wind 330 degrees magnetic at seven knots, altimeter 29.81 inches.

ANALYSIS:

A service representative of de Havilland reported their tests have shown that, in normal operating conditions, ice does not form in the intake areas when the aircraft is airborne. From this information it must be concluded that the ice found in the intake areas following the engine power loss formed while the aircraft was on the ground at Timmins and Kapuskasing. Enough snow had fallen on the airframe at Timmins to require de-icing prior to flight, but the engine intake areas had not been plugged and were not inspected before take-off. Considerable snow probably accumulated in these areas at this time and while awaiting flight clearance on the ground at Timmins.

During walkaround inspections, the engine intake areas cannot be inspected without the use of a ladder because of their height above ground. The crew did not inspect the engine intakes and therefore could not tell if snow or ice was present prior to each of the two take-offs. Judging by the amount of ice reported in the engine intake areas after the engine failure, considerable ice had accumulated while the aircraft was on the ground.

The amount of ice found in the intake areas of the engine nacelles shows that the loss of power in the left engine occurred when some ice was ingested by the engine during the climb. As the crew shut down the engine rapidly, it is not known if the engine flamed out completely. Had the crew used a ladder to inspect the engine air intakes prior to the take-offs, the presence of the ice would have been detected. The power loss would probably have been avoided had the ignition been selected to the MANUAL position at the time.

CONCLUSIONS:

Findings:

1. Five minutes after take-off while the aircraft was climbing through 7,000 feet, the left engine suddenly lost power.

2. An accumulation of ice was found in the engine intake areas; the left engine had the greatest accumulation.

3. There was no evidence of any failure or malfunction of the aircraft or any of its systems that would have contributed to the loss of engine power.

4. The aircraft sat for 25 minutes without engine inlet plugs in place during a heavy wet snowfall.

5. The weather conditions prevailing at the time were conducive to snow accumulation in the engine intake areas during ground operation.

6. The engine intake areas are not visible on walkaround inspections without the use of a ladder, and the crew did not inspect the engine intake areas.

7. Continuous ignition had not been selected at the time as recommended in the aircraft operating manual.

Causes:
The left engine lost power because of ice ingestion.

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RISK OF COLLISION BETWEEN: BOEING 767-233 C-GAUW and DE HAVILLAND DHC-8 DASH 8 C-GJMO TORONTO/LESTER B. PEARSON INTERNATIONAL AIRPORT, ONTARIO 50 mi NW 20 OCTOBER 1987

REPORT NUMBER: 87-O/74230 (Incident)
LOCAL TIME: 1220 EDT
INFORMATION SOURCE: Field Investigation

BOEING 767-233 C-GAUW

OPERATOR: Air Canada
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transpo

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	20,000	2,100
LAST 90 DAYS	65	65

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	9
PASSENGERS	-	-	171

DE HAVILLAND DHC-8 DASH 8 C-GJMO

OPERATOR: Air Ontario
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	10,000	400
LAST 90 DAYS	260	255

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	4
PASSENGERS	-	-	30

HISTORY OF THE FLIGHT:

Air Ontario Flight 273, a De Havilland DHC-8, departed the Toronto/Lester B. Pearson International Airport and was at flight level (FL) 220 on a track direct to Sault Ste Marie. Air Canada Flight 109, a Boeing 767, departed the same airport on the same track and was climbing to FL390. Following the appropriate hand-off from the terminal controller, the en route controller cleared Air Canada 109 direct to Sault Ste Marie. At this time, spacing of 40 nautical miles existed between the two aircraft, and the controller directed his attention to other duties. Minutes later, the controller looked at the radar presentation and observed two collocated targets: Air Canada 109, leaving FL212, and Air Ontario 273 level at FL220. The controller then instructed the crew of Air Canada 109 to descend to FL210 and they complied immediately; however, the momentum of the aircraft, which was climbing at a calculated rate of 2,100 feet per minute, brought it to FL219 before the descent could be initiated.

PERTINENT INFORMATION:

Staffing at the Toronto Area Control Centre, at the sector involved, was compatible with the workload and was not a factor in this occurrence.

No equipment deficiencies were reported to have had a bearing on the occurrence. The en route (Wiarton) sector was operated in a combined mode; that is, with the data and radar positions staffed by only one controller, which allows controllers to have breaks. A trainee controller was performing all the duties of both positions, and an instructor was monitoring the operation.

The possibility of a conflict between Air Canada 109 and Air Ontario 273 was first identified by the terminal controller who confirmed with the en route trainee controller that Air Canada 109 should remain cleared on the flight planned airway. Following the transfer of control and communications regarding Air Canada 109, the

en route trainee controller cleared the aircraft direct to Sault Ste Marie, to maintain FL390. The trainee controller then proceeded with data and coordination operations on the interphone system, and the instructor, who was monitoring the general operation of the sector, was distracted when another controller came in to discuss the relief break schedule. The trainee controller then turned his attention to the radar presentation and observed that the two aircraft were close to each other. Because of the necessary reaction time, the time required to transmit the descent instructions, and the momentum effect, Air Canada 109 had reached FL219 before descent could be initiated. The crew of Air Ontario 273 saw in the cloud 500 feet below them Air Canada 109 descending.

The weather at Wiarton, (20 miles north of the position of the occurrence) at 1200 eastern daylight time (EDT) was balloon ceiling 800 feet broken, 1,200 feet overcast, visibility three miles in light rain showers and fog. The top of the clouds was reported minutes earlier as between 25,000 and 30,000 feet above sea level.

The instructor was informed of the near miss by the trainee controller immediately after he instructed Air Canada 109 to descend.

The instructor and the trainee controller had been on duty for 5 hours and 45 minutes at the time of the occurrence.

ANALYSIS:

Air Canada 109 and Air Ontario 273 were cleared on the same track direct to Sault Ste Marie. Air Ontario was flying at FL220, 40 miles ahead of Air Canada 109 which was climbing to FL390.

The operation of a sector in a combined mode requires one controller to perform data duties, flight progress strip posting, and radar monitoring duties. By clearing both aircraft on the same track with the following faster aircraft going to a higher altitude, the trainee controller created a situation requiring constant monitoring on the radar display. When the attention of both controllers was diverted from the radar display, the positions of the two aircraft were not monitored; this situation allowed Air Canada 109 to come within 100 feet vertically of Air Ontario 273. The required separation is five miles horizontally or 1,000 feet vertically.

As both aircraft were in cloud, it was not possible for the crew of Air Canada 109 to see the other aircraft.

CONCLUSIONS:

Findings:

1. Staffing at the Toronto Area Control Centre, at the sector involved, was compatible with the workload and was not a factor in this occurrence.

2. No equipment deficiencies were reported that could have had a bearing on the occurrence.

3. The Wiarton Sector was being operated in a combined mode to allow the controllers to have breaks. This operation led to a trainee controller performing all the duties of the sector without adequate supervision.

4. The trainee controller created a situation which required continuous monitoring when he cleared the faster aircraft to a higher altitude than the preceding aircraft flying on the same track.

5. The trainee controller directed his attention to data duties and stopped monitoring the radar display.

6. The instructor's attention was diverted from the operation of the sector.

Causes:

The instructor allowed the controller in training to place himself in a situation where continuous monitoring was required, and both the instructor and the controller in training diverted their attention to activities other than radar surveillance.

RISK OF COLLISION BETWEEN:
MCDONNELL-DOUGLAS DC-9-32 C-FTLQ and
CESSNA 210 N3754Y
REGINA, SASKATCHEWAN 15 mi NW
13 NOVEMBER 1987

REPORT NUMBER: 87-C74100 (Incident)
LOCAL TIME: 0813 CST
INFORMATION SOURCE: Office Investigation

MCDONNELL-DOUGLAS DC-9-32 C-FTLQ

OPERATOR: Air Canada
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		FIRST OFFICER	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	9,600	N/A	N/A	N/A
LAST 90 DAYS	N/A	N/A	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	5
PASSENGERS	-	-	39

CESSNA 210 N3754Y

OPERATION: Private Company Business
DAMAGE: None
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	N/A	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

HISTORY OF THE FLIGHT:

Air Canada (AC) Flight 203, a scheduled DC-9 service to Calgary, Alberta, departed Regina Airport at 0809 central standard time (CST) and was given a radar vector to intercept high-level airway 504 with an unrestricted climb to flight level 310. The Regina Terminal Controller reported unidentified, opposite direction traffic to the DC-9 at 0812 CST. At 0813 CST, the DC-9 captain reported that he had had to take evasive action to avoid a collision with a Cessna-type aircraft as the DC-9 was climbing through 12,000 feet above sea level (asl). The DC-9 continued on to Calgary where it landed without further incident.

PERTINENT INFORMATION:

The unidentified aircraft, in cruise flight at an altitude of 12,000 feet asl, was showing transponder code 1200 instead of 1400; 1400 is the correct code for visual flight rules (VFR) flight above 10,000 feet asl. The Regina Terminal Radar was not equipped to display the aircraft's altitude. The aircraft was tracked by Winnipeg and Minneapolis Radar Unit personnel to a landing at Minot, North Dakota, where the aircraft and pilot were identified. When contacted, the pilot admitted to a lack of knowledge of Canadian air regulations, although he was a frequent user of Canadian airspace; he also admitted to a display of poor airmanship in that he was flying at an incorrect cruise altitude for VFR flight, and that he had the wrong transponder code dialled in. He did not establish contact with Regina Air Traffic Control, nor was this required at his position and altitude.

ANALYSIS:

The DC-9 was operating in accordance with the applicable flight rules and as cleared by air traffic control. The VFR aircraft, however, was being operated at an incorrect altitude and was showing a transponder code that indicated flight at 10,000 feet asl or lower. Had the pilot established communication with the terminal at Regina the near miss could have been prevented.

CONCLUSIONS:

Findings:
1. The Cessna pilot was squawking the wrong transponder code.

2. The Cessna pilot was flying at an incorrect cruise altitude for VFR flight.

3. The Cessna pilot did not establish radio contact with Regina Air Traffic Control, nor was this required at that position and altitude.

4. The pilot of the DC-9 aircraft took evasive action to avoid collision with the Cessna.

Causes:
The pilot of the light aircraft failed to comply with appropriate flight rules.

AIR CREEBEC INC.
HAWKER SIDDELEY HS 748 C-GQTG
TIMMINS AIRPORT, ONTARIO
12 DECEMBER 1987

REPORT NUMBER: 87-O/74261 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1812 EST
OPERATION: Charter
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	CAPTAIN		FIRST OFFICER	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	12,975	1,350	6,569	898
LAST 90 DAYS	259	259	239	239

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	4
PASSENGERS	-	-	38

HISTORY OF THE FLIGHT:

The aircraft was on a passenger charter flight from the Timmins Airport to the Waskaganish Airport and was operating in accordance with the instrument flight rules (IFR). The first officer was at the controls. At approximately 95 knots indicated airspeed (KIAS), the crew detected that the aircraft was not accelerating properly and observed that the right engine torque indicator had decreased to approximately 180 pounds per square inch (psi) when it should have been indicating 340 psi. The captain took over control of the aircraft, closed the throttles, and applied the brakes. The aircraft came to a stop approximately 700 feet off the end of the runway and 100 feet to the right of the extended runway centre line. The aircraft was not damaged, and the occupants were uninjured. Crash Fire Fighting Rescue Services (CFR) responded but were not required. The passengers and crew exited the aircraft through the main exit/entrance doors.

PERTINENT INFORMATION:

The Timmins Airport is a publicly licensed airport, operated by Transport Canada. Runway 03 is 6,000 feet long by 200 feet wide with an asphalt surface. The runway has a 1,000-foot clearway with no stopway. The runway surface was reported as 30 per cent bare and wet, 40 per cent light snow covered, and 30 per cent ice patches at the time of the occurrence. The average James Brake Index (JBI) was 0.35, which is the coefficient of friction of the runway.

The data for the take-off conditions at the time of the occurrence were as follows:

Aircraft Gross Weight	— 42,849 pounds
Flap Setting	— 7 1/2 degrees
Power	— Dry (water methanol not used)
Airport Elevation	— 962 feet above sea level
Temperature	— 0 degrees Celsius
Wind	— 130 degrees magnetic at less than 5 knots
TODA	— 7,000 feet
ASDA	— 6,000 feet

The computed data for the take-off was as follows:

V_1	— 106 KIAS
V_2	— 111 KIAS
ASD Required	— 5,000 feet

The aircraft was equipped with a Fairchild Model 5424-22114, flight data recorder which was sent to the National Research Council Flight Recorder Playback Centre for analysis of the data. The recorder was found to be out of operational tolerance; however, meaningful data were retrieved following calibration of the unit. Analysis of the data revealed that the aircraft accelerated to 95 KIAS, 4,000 feet from the threshold of the runway, then began to decelerate. The cockpit voice recorder was not taken from the aircraft.

The engine fuel pump, in addition to supplying fuel under pressure to the engine, acts as a governor to control engine rpm. The governor sets the maximum rpm on the engine by controlling fuel flow to the flow control unit; the governor is speed sensitive. If the governor setting drifts downwards, reducing the fuel flow, the engine maximum speed setting also reduces. Since this is a turbo-prop engine, the propeller control unit will then attempt to maintain the propeller at its constant speed by reducing propeller pitch angle. The result is a loss of torque because of a reduction of fuel flow.

The governing speed is set by an adjustment screw on the fuel pump governor and is locked in position with a lock nut. Following the occurrence, the adjustment screw and lock nut were found secure with the lock nut wired in position.

An engine ground run carried out after the occurrence revealed that the governing limit was approximately 1,100 rpm low, reducing the engine maximum torque to below 200 psi instead of the normal 340 psi. The adjustment screw was reset to increase engine rpm; the engine ran satisfactorily, and no other engine discrepancies were found. The fuel pump governor had been in service 1,432 hours since last overhaul and had been installed on the engine 21 August 1986. A fuel governing maintenance check was carried out as per the engine

manufacturer's specifications on 13 September 1987. The fuel governor had operated for 230 hours following the maintenance check.

The fuel pump governor was sent to the manufacturer for testing and examination. There were no discrepancies noted, and performance was within the manufacturer's test specifications. The adjustment screw was of the latest design.

There was no evidence of tire hydroplaning or failure of the aircraft's anti-skid brake system.

ANALYSIS:

The engine fuel pump governor on the right engine went out of calibration which resulted in a reduced fuel flow to the engine fuel control unit, causing a loss of engine power on the right engine. The reason why the governor went out of calibration could not be determined.

The take-off was planned, and the rejected take-off was performed in accordance with existing regulations and procedures; however, the aircraft did not stop on the runway. ASD requirements are based upon performance data for bare, dry runways, but, in this case, the runway was slippery. Because of the reduced coefficient of friction between the aircraft tires and the runway, the stop distance for the ASD was increased.

Given the runway surface conditions at the time of the occurrence, there was insufficient runway left when the take-off was rejected to bring the aircraft to a stop on the runway, and the aircraft overran the end of the runway.

CONCLUSIONS:

Findings:

1. The right engine lost power prior to the aircraft attaining V_1 speed.

2. In accordance with established procedures, the captain rejected the take-off.

3. The runway surface was contaminated with water, snow, and ice, which reduced the coefficient of friction between the aircraft tires and the runway surface.

4. The distance required to stop the aircraft on the runway exceeded the distance available, and the aircraft overran the end of the runway.

5. The aircraft engine fuel pump governor went out of calibration which caused the engine to lose power.

6. The reason why the fuel pump governor went out of calibration could not be determined.

Causes:

Because the runway was slippery, the distance required to stop the aircraft exceeded the distance which was available. Pre-flight take-off performance calculations did not take into account the effects of the wet, slippery runway surface.

SAFETY ACTION:

Action Taken:

Following a runway overrun involving a Boeing 737 on a rejected take-off at Wabush, Newfoundland (Occurrence Report Number 86-A60024), the Canadian Aviation Safety Board recommended that:

The Department of Transport revise air carrier procedures involving wet runway take-off operations, in order to provide a margin of safety comparable to that for dry runway operations.

CASB 87-45

The Department of Transport require air carriers to improve flight crew knowledge of the effects of wet runways on take-off performance and the means available to flight crews to provide a margin of safety comparable to that for dry runways.

CASB 87-46

TRANS WORLD AIRLINES INC.
BOEING 767-231 N604TW
NORTH ATLANTIC 61°00'N 55°00'W
14 JANUARY 1988

REPORT NUMBER: 88-A0014 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1410 AST
OPERATION: Scheduled International
DAMAGE: Nil
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	11,796	3,043	13,198	1,455
LAST 90 DAYS	N/A	N/A	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	9
PASSENGERS	-	-	132

SUMMARY REPORT:

The aircraft was on a transatlantic flight from London, England to St. Louis, United States. About 350 miles northwest of Goose Bay, Newfoundland, an impending bypass of the right engine (Pratt & Whitney JT9D-7R4) oil filter was indicated by the illumination of a warning light in the cockpit. After the filter bypass light illuminated, the captain reduced power on the affected engine until the light went out. Approximately 10 minutes later, the filter bypass light came on again, and the captain reduced the power to idle thrust where the light went out. The light re-illuminated approximately 20 minutes later, at which time, the captain followed the appropriate procedure and shut down the engine.

The aircraft diverted to, and landed at, Goose Bay Airport, Newfoundland, where an inspection of the oil filter was carried out. A substantial amount of silver flakes was found in the filter; the operator decided to remove the engine and ship it to their maintenance facility for teardown.

The main gearbox was removed from the engine and disassembled.

Examination revealed that approximately 40 per cent of the silver plating on the main oil pump drive gearshaft gear teeth had peeled off. The metal found in the oil filter was analysed, and it was determined to be silver. However, the quantity of silver plating missing from the gear teeth and found in the oil filter was not enough to clog the filter and cause a bypass condition.

Further examination of the oil filter revealed a greyish-black substance engrained in the filter paper. This paper is normally a light brown or tan colour. The contaminated oil filter from this engine and an oil filter from another engine were sent for comparative analysis. The analysis revealed that the contaminated oil filter had a significantly higher-than-normal iron content and that silica was also present.

Based on the laboratory analysis and the fact that no cause was found for the greyish-black substance in the oil filter or the extremely dirty oil found in the engine, the TWA Engine Review Committee decided to disassemble the entire engine. Inspection of all the main-line bearings and associated carbon seals, as well as the angle gearbox, did not reveal any discrepancies or abnormalities.

CONCLUSIONS:

Findings:
1. The right engine impending bypass oil filter warning light illuminated in flight.

2. The captain shut down the engine and landed at the nearest alternate airport.

3. Approximately 40 per cent of the silver plating on the main oil pump gearshaft gear teeth had peeled off.

4. The oil filter was contaminated with a greyish-black substance, a higher-than-normal iron content, and traces of silica.

Causes:
The oil filter was contaminated with a greyish-black substance which caused an impending bypass condition. The source of the contaminant was not determined.

RISK OF COLLISION BETWEEN: MCDONNELL DOUGLAS DC-10-30 C-GCPJ and BRITISH AEROSPACE JETSTREAM 3112 C-FAMJ TORONTO/LESTER B. PEARSON INTERNATIONAL AIRPORT, ONTARIO 19 JANUARY 1988

REPORT NUMBER: 88-O/0023 (Incident)
LOCAL TIME: 2002 EST
INFORMATION SOURCE: Field Investigation

MCDONNELL DOUGLAS DC-10-30 C-GCPJ

OPERATOR: Canadian Airlines International
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	CAPTAIN		FIRST OFFICER	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	13,000	5,000	N/A	N/A
LAST 90 DAYS	200	200	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	13
PASSENGERS	-	-	195

BRITISH AEROSPACE JETSTREAM 3112 C-FAMJ

OPERATOR: Canadian Partner
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	CAPTAIN		FIRST OFFICER	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	14,000	125	N/A	N/A
LAST 90 DAYS	200	120	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	13

HISTORY OF THE FLIGHT:

At 2001:28 EST, C-FAMJ, a Jetstream with callsign Partner 926, landed on runway 06L within the first third of the runway. Following touchdown, the captain was instructed to take the next right turn off the runway without delay at Papa taxiway. Instead, the captain turned left onto Juliett taxiway which was blocked by a Cessna 172 aircraft. The captain informed the tower controller of the Cessna, and the Jetstream was then instructed to go straight ahead on Juliett taxiway and clear the runway as traffic was landing behind him. Unable to clear on Juliett, the captain re-entered the runway.

At 2002:32 EST, C-FGPJ, a DC-10 with callsign Canadian 4, was cleared to land and had just touched down on 06L when the tower controller instructed the DC-10 to pull up and go around. As the DC-10 had landed and had the spoilers deployed and reverse thrust selected, the captain was unable to respond to this instruction, and the DC-10 continued down the runway. The DC-10 captain was able to slow his aircraft so that he did not overtake the Jetstream taxiing on the runway. He estimated that there was at least 2,000 feet between the two aircraft during his roll-out. Both aircraft continued to taxi to the terminal without further incident.

PERTINENT INFORMATION:

The aircraft were separated by five miles at the outer marker for 06L. Following the landing, the Jetstream pilot did not follow taxi instructions, turning left onto Juliett instead of right onto Papa taxiway. A Cessna 172 aircraft awaiting take-off clearance was blocking taxiway Juliett which prevented the Jetstream from progressing further. The captain of the Jetstream later reported that his aircraft did not fully clear the runway, leaving the right wing overhanging the runway edge. At this time, the tower supervisor took over from a trainee who had been controlling the aircraft and instructed the Jetstream to proceed straight ahead on Juliett and clear the runway. Unable to clear the runway because of the Cessna 172, the captain taxied the aircraft back onto the runway and exited right on runway 10. The tower operator could not see the Jetstream clear the runway at Juliett because it was dark and Juliett taxiway is about one mile from the tower.

The captain of the Jetstream had flown into Toronto three times earlier in the day, each time landing on 06R and taxiing off the high-speed Charlie taxiway. The captain had departed his home in London by bus at 0400 EST in order to check in at 0645 EST at his base in Toronto. He was airborne at 0800 EST and had completed four trips, two Toronto-Windsor-Toronto and two Toronto-London-Toronto, for a total of 7.1 hours flying time. He had been on duty for 13.25 hours.

Because of the delay in the Jetstream clearing the runway, the landing clearance to the DC-10 was not issued until approximately 11 seconds before the Jetstream had partially cleared the runway. When the controller saw the Jetstream re-enter the runway, he instructed the DC-10 pilot to go around.

Air Traffic Services (ATS) MANOPS 352.2 states:

Separate an arriving aircraft from a preceding aircraft using the same runway by ensuring that the arriving aircraft does not cross the landing threshold until one of the following conditions exists:

a) The preceding aircraft has landed and taxied off the runway;

b) The preceding aircraft is at a sufficient distance from the threshold to allow the arriving aircraft to complete its landing roll without jeopardizing safety.

The weather at the time was reported as ceiling variable 900 to 1,200 feet overcast; visibility 12 miles; temperature zero degrees Celsius, dew point minus one degree Celsius; wind 090 degrees at 14 gusting to 19 knots; altimeter 30.09 in.; strato cumulus 10/10.

ANALYSIS:

The Jetstream aircraft was slow to clear the runway because of the Cessna 172. When the Jetstream captain reentered the runway and the pull-up and go-around instruction was given to the DC-10 crew, the DC-10 was already on the runway and decelerating.

The captain of the Jetstream had had a long working day and was probably affected by fatigue. It would appear that he thought he was landing again on runway 06R and turned left as before rather than right as instructed.

CONCLUSIONS:

Findings:

1. The Jetstream captain did not carry out the taxi instruction issued by the tower controller and turned left onto Juliett instead of right onto Papa taxiway.

2. Entrance to Juliett taxiway was blocked by a waiting aircraft, and the Jetstream could not completely clear the runway.

3. Unable to exit at Juliett, the Jetstream captain re-entered the runway.

4. The DC-10 was cleared to land while the Jetstream was still on the runway; the controller thought the Jetstream had cleared the runway.

5. The tower operator could not see the Jetstream aircraft clear the runway because of the darkness and distance from the tower.

6. The DC-10 captain was able to bring his aircraft to a safe stop and maintained a minimum of 2,000 feet between the two aircraft on the runway.

7. The Jetstream captain's performance and reactions were probably affected by fatigue.

Causes:

The captain of the Jetstream aircraft did not follow the runway clearing instructions issued by the tower controller.

AIR NOVA INC.
DE HAVILLAND DHC-8-102 C-GANF
ST. JOHN'S, NEWFOUNDLAND
14 FEBRUARY 1988

REPORT NUMBER: 88-A0039

Pilot Licence	Pilot-In-Command Airline Transport	Co-Pilot Airline Transport
Total Flying Time	8,400 hr	5,000 hr
Total on Type	1,500 hr	550 hr
Total Last 90 Days	210 hr	210 hr

Injuries	Crew	Passengers	Others	Total
Fatal	-	-	-	-
Serious	-	-	-	-
Minor/None	3	20	-	23
Total	3	20	-	23

HISTORY OF THE FLIGHT:

At 2036 Newfoundland standard time (NST) on 13 February 1988, an Air Nova Inc., de Havilland DHC-8-102, registration C-GANF, arrived in St. John's, Newfoundland on a scheduled flight from Gander, Newfoundland. The same aircraft and crew were scheduled for a flight to Goose Bay, Newfoundland the following morning. They parked the aircraft on the ramp and secured it for outside overnight parking. During the night there was precipitation, including snow, freezing rain, and rain accompanied by strong winds. The temperature varied around the freezing mark.

At 1012 NST the next day, the aircraft departed runway 29 on a scheduled instrument flight rules (IFR) flight to Goose Bay, Newfoundland. One minute and 19 seconds after take-off, while the aircraft was climbing through 1,800 feet above sea level (asl) in visual conditions, the right engine flamed out. The flight crew secured the engine and prepared for a right-hand visual approach to runway 29.

Two minutes and 50 seconds after the right engine flamed out, the left engine flamed out. When the pilot turned the aircraft toward the airport, he assessed that

the aircraft was beyond gliding distance from the closest runway and selected a nearby frozen lake as an alternate landing site. Five seconds after it had flamed out, the left engine re-lit and, in the following 17 seconds, returned to near full power. The pilot then decided to complete a visual approach to runway 16, which was the closest suitable runway. After a successful single-engine landing, the aircraft was towed to the ramp.

The incident occurred near St. John's Airport, Newfoundland at lat 47°37'N, long 52°45'W at 1017 NST during the hours of daylight.

PERTINENT INFORMATION:

Air Nova does not have a maintenance base in St. John's, and flight crews are responsible for installing the covers and protective devices necessary for outside overnight parking. To protect the engines from contamination, the flight crew installed intake plugs in the engine air intakes.

In the morning, when the crew arrived to prepare the aircraft for departure, there was no ice or snow visible anywhere on the aircraft. They discovered that the engine plugs had been dislodged by the wind and had been reinserted with additional rubber material around the edges to give them a tighter friction fit. In addition to the normal pre-flight inspection of the aircraft, the captain did an engine run-up to check for vibration which would indicate an ice buildup in the propeller spinners. There was no vibration.

The pre-flight inspection to be performed by the flight crew is outlined in Air Nova Standard Operating Procedures Dash 8 Walkaround Check-list. One item of this check-list is "Engine Intake – Clear." On the Dash 8, the inside bottoms of the engine intakes are not visible from ground level or from inside the aircraft.

During the night when the strong winds had blown the intake plugs out, ground personnel from an associated company had reinstalled them after placing a rubber material around the diameter of each plug to make a tighter fit.

The plugs were initially inserted by the flight crew at about 2100 NST and were found dislodged and reinstalled at about 2400 NST. It could not be determined how long the plugs had been out. The ground personnel did not inform the flight crew that the plugs had been dislodged and had been reinstalled; however, this was obvious to the crew because of the addition of the rubber material.

The inlet plugs being used at the time were the original plugs supplied with the aircraft by the manufacturer and were made from polyethylene foam. The plugs were designed for a friction fit, but they have a history of blowing out of the intakes in windy conditions. The operator had attached a line to each plug and secured the line to the aircraft so that if a plug blew out, it would not blow away.

A newer model of the plug is now being produced. The new plug uses a dense sponge material, which provides a tighter fit and is less susceptible to being blown out in windy conditions.

The inside bottoms of the engine air intakes are shaped like shallow bathtubs, and drain holes are incorporated to prevent water from pooling in the bottom if rain should enter when the aircraft is parked.

After the occurrence, the engine intakes were examined. A sheet of ice approximately one and one-half inches thick partially covered the bottom of each intake. Sections of the ice in each intake had broken away. Additional ice buildup was found directly in front of the bypass door of each engine.

The ice remaining in the right engine covered the rear half of the bottom of the intake scoop. The front half of the bottom of the intake was clear. A clean break line was noted where the ice, which had been in the front portion of the intake, had broken free. There was a lesser amount of ice remaining in the left engine intake; however, enough ice remained to provide evidence that an amount similar to that found in the right engine had at one time been present in the left engine.

The Dash 8 was certified under United States Federal Aviation Regulation (FAR) Part 25, FAR 36, and Special FAR 27. The engines were certified under FAR Part 33. FAR 33.69 (Ignition Systems) states in part that "each engine must be equipped with an ignition system for starting the engine on the ground and in flight."

The Dash 8 has a three-position ignition switch for each engine; OFF, NORMAL, and MANUAL. The normal position is used for starting, and engine ignition is automatically turned off on completion of the start sequence. The manual position provides continuous ignition to the engine.

FAR 25, Chapter 25.1309 Paragraph B, outlines reliability requirements for the aircraft equipment, systems, and installations. In general, this paragraph discusses the testing required to determine the probabilities of failure. During certification of the engine, strenuous testing was conducted to prove that the engine would not flame out, even when subjected to such adversities as water ingestion, bird strikes, and foreign-object ingestion.

At the time of certification, it was determined, through this testing process, that the chance of engine flame-out on this engine was so remote that continuous ignition was not required during take-offs and landings in normal conditions.

There is a requirement for manual ignition to be selected when the aircraft is operating below 1,500 feet above ground level (agl) in the vicinity of any storm cloud formation. This restriction was imposed because the engine electronic fuel control units and associated circuitry are considered vulnerable to transients induced by lightning strike. In addition, manual ignition should be selected when operating in the air or on the ground in conditions of turbulence, icing, or heavy precipitation. The Aircraft Flight Manual (AFM) defines when icing conditions exist including when the static air temperature (SAT) on the ground and for take-off is 10 degrees or below when operating on ramps, taxiways, or runways where surface snow, ice, standing water, or slush may be ingested by the engines or freeze on the engines, nacelles, or engine sensor probes. None of these conditions was judged to exist when this aircraft started its take-off, so manual ignition had not been selected.

For easy reference in the cockpit, the aircraft manufacturer had produced a quick reference check-list (QRC). Air Nova produced an identical QRC for its crews' use. A discrepancy existed between these QRCs and the relevant check-list in the AFM current at the time of the occurrence.

This AFM check-list for an engine power loss or shutdown contained the following procedure:

"Ignition switches – operating engine – manual; failed engine – off."

The QRC contained two different engine shutdown procedures:

1) "Engine failure or fire on take-off after V1" – normally to be used if an engine failure occurs below 1,000 agl; and,

2) "Engine shutdown in flight" – normally to be used above 1,000 feet agl. (This is the check-list used by the crew in this occurrence.)

The QRC "engine failure or fire on take-off after V1" check-list differed from the current AFM in that it simply stated, "ignition switch – off" for the failed engine and did not call for the ignition switch on the operating engine to be turned to manual.

ANALYSIS:

The investigation indicated that ice had formed in the engine intakes from precipitation which entered the intakes while the engine intake plugs were out. After take-off, some of this ice broke free, causing the engines to flame out from the momentary disruption to the airflow.

During the time the plugs were out of the intakes, the temperature was at or below the freezing point, and the aircraft was subjected to snow, blowing snow, freezing rain, ice pellets, and rain. For the drain holes to be blocked, some freezing or frozen precipitation had to accumulate in the bottom of the intakes. Since the freezing precipitation changed to rain at 2300 NST, it is likely that the plugs were dislodged before that time. Although the temperature rose to above freezing during the night and melted the ice or snow from the fuselage and wings of the aircraft, the temperature was not high enough to melt the accumulation in the intakes and clear the intake drains.

Company procedures require that the engine intakes be inspected on the pre-flight inspection, the accepted practice being a visual inspection from ground level. However, the bottoms of the intakes are not visible from the ground, or even from the top of the airstairs or from inside the aircraft. It would have been necessary for the crew to utilize a ladder in order to gain an unobstructed view of the inside of the intakes.

Although both the company and the crew knew of the poor retention qualities of the intake plugs in windy conditions, neither was aware of any problems associated with contamination of the engine intakes as a result of this poor retention. They were, however, aware of the problem of ice buildup in the propeller spinners, and the crew carried out a run-up to ensure the spinners were clear of ice. The run-up showed there was no ice in the spinners, and, as there was no ice or snow clinging to any part of the aircraft, the crew had no reason to believe that any extraordinary pre-flight inspection procedures were necessary.

The ice continued to adhere to the bottom of each intake until, as the airspeed increased during climb-out, the suction of the passing air caused some of the ice to break away. When the front half of the ice in the right engine broke free, the momentary disruption to the engine intake air caused the engine to flame out. There was no possibility of an automatic engine re-light because the ignition switch for that engine was in the normal position.

In securing the right engine by use of the "Engine Shutdown In-Flight" QRC, the crew selected manual ignition for the left engine. When the ice gave way in the

left intake scoop, the left engine flamed out, however, it automatically re-lit because the ignitors were on.

During the certification process, the engine, mated to the DHC-8 engine intake cowl, passed rigorous testing designed to demonstrate resistance to flame-out and mechanical damage caused by foreign object ingestion. The engine intake cowl is designed so that foreign objects of a size unacceptable to the engine bypass the engine inlet. During the occurrence, the ice already in the intake broke free, and the resultant sudden disruption of the airflow entering the engine inlets was sufficient to cause flame-out. The lack of impact damage within the engines suggests that the ice mass broke up, and the majority of the pieces exited through the bypass doors opened by the crew before take-off.

For easy reference in the cockpit, the aircraft manufacturer had produced a QRC. Air Nova produced an identical QRC for its crews' use. The specific manufacturer's QRC copied by Air Nova reflected the AFM current when Air Nova accepted their first Dash 8 aircraft. At that time, the AFM required ignition to be selected to manual during every take-off and subsequently switched to normal by the time the aircraft was at 1,000 feet agl. Therefore, a requirement (during an engine failure drill) for the selection of ignition to manual below 1,000 feet agl would have been redundant. When the AFM was subsequently changed, the operator did not change the QRC.

The AFM current at the time of this incident required that the ignition be selected to manual before take-off only in specific conditions; these conditions did not exist for the incident take-off. In the AFM current at the time of the incident, only one engine shutdown procedure for all airborne emergencies was specified.

Because the aircraft was above 1,000 feet agl when the right engine flamed out, the flight crew used the "Engine Shutdown In-flight" QRC, which called for manual ignition on the operating engine to be turned on. Had the flame-out occurred at an altitude below 1,000 feet agl, and the QRC aboard the aircraft for "Engine Fire or Fail V1" been used, the manual ignition on the left engine would not have been turned on, and the engine would not have re-lit.

CONCLUSIONS:

Findings:

1. The design of the original polyethylene foam engine intake plugs was such that they were susceptible to being blown out by the wind.

2. The engine plugs were blown out by the wind.

3. Ice which had accumulated in the bottom of the engine air intakes was not detected at the time that the plugs were reinserted.

4. There was no communication between the flight crew and ground personnel about the fact that the intake plugs had been removed for a period of time.

5. The bottom of each engine intake was not examined during the pre-flight inspection; therefore, the ice was not detected.

6. The ice broke free during climb-out, disrupting the airflow to the engines and causing them to flame out.

7. The "Engine Fire or Fail After V1" quick reference check-list did not conform to the current Aircraft Flight Manual.

Causes:

Ice, which had accumulated in the engine intakes while the aircraft was parked overnight, was not detected during the pre-flight inspection. The ice broke free during climb-out and disrupted the airflow to the engines.

SAFETY ACTION:

Action Taken:

On 23 February 1988, the aircraft manufacturer issued Advisory Notice No. 27 to all Dash 8 operators, Transport Canada, the Federal Aviation Authority, and the Civilian Aviation Authority outlining the events of this occurrence. This Advisory Notice recommended that a visual inspection of the engine intakes be undertaken prior to engine start-up if the aircraft has been parked without the engine intake plugs in place, or if there is any reason to believe that the plugs may have been temporarily dislodged, and the aircraft has been subjected to precipitation in temperatures below 10 degrees Celsius.

Recognizing the shortcomings with respect to the fit of the Styrofoam engine intake plug originally designed for the Dash 8, the manufacturer introduced a more durable one of polyethylene material with improved retention characteristics. Accordingly, the Canadian Aviation Safety Board forwarded an Aviation Safety Information Letter to Transport Canada in May 1988 suggesting that all Dash 8 operators be apprised of the availability of the new intake covers; the aircraft manufacturer has subsequently done so. Furthermore, the air carrier of this occurrence took the extra precaution of supplying its aircraft with its own redesigned engine intake covers that fit over the intake and are secured to the engine cowling.

During the early stages of the analysis of this occurrence, it was reasoned that, had the ignition switches been "on", then a double engine flame-out would have

been unlikely. Since the Aircraft Flight Manual for the Dash 8 did not call for engine ignition switches to be selected to MANUAL for normal take-offs and landings, the Canadian Aviation Safety Board issued an Aviation Safety Advisory to Transport Canada suggesting that consideration be given to the mandatory use of manual ignition for all take-offs and landings in Dash 8 aircraft. In response to this advisory, Transport Canada found it unneccessary from an airworthiness perspective to make changes to the DHC-8 approved Flight Manual based on this incident. However, Transport Canada sent to the manufacturer the suggestion to consider revising their Operation Manual Procedures to reflect the use of manual ignition for all take-offs and landings.

The Board notes that Advisory Notice No. 27 issued by the manufacturer now recommends adherence to the procedures entitled "Operations in Icing Conditions" as outlined in the Aircraft Flight Manual; i.e., manual ignition should be selected when operating in the air or on the ground at 10 degrees Celsius or below and where snow, ice, standing water, or slush may be ingested by the engines. The Board also notes that some Canadian air carriers, including Air Nova, have instituted company Dash 8 operating procedures calling for ignition to be selected to MANUAL for all take-offs and landings, irrespective of the ambient conditions.

Notwithstanding the actions taken, the Board remains concerned that there may be operating conditions beyond those already covered in de Havilland's Advisory Notice No. 27 which may warrant the selection of the ignition switch to the MANUAL position for all take-offs and landings in the Dash 8. Furthermore, the Pratt & Whitney PW 120 series of engines is incorporated in several other types of aircraft for which such an operating practice may be warranted. The Board is not aware of any technical reasons which would contra-indicate such use of manual ignition. In view of the potential consequences of an engine flame-out on take-off or landing, the Board recommends that:

The Department of Transport require the selection of the ignition switch to MANUAL for all take-offs and landings on Dash 8 aircraft.

CASB 89-07

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CANADIAN AIRLINES INTERNATIONAL BOEING 737-217 C-GCPT VANCOUVER INTERNATIONAL AIRPORT, BRITISH COLUMBIA 21 FEBRUARY 1988

REPORT NUMBER: 88-P0029 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1845 PST
OPERATION: Scheduled Domestic
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	13,675	5,400
LAST 90 DAYS	231	231

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	6
PASSENGERS	-	-	10

SUMMARY REPORT:

The Boeing 737 was being prepared for departure at Gate 20 at Vancouver International Airport, British Columbia, and the crew started the aircraft's auxiliary power unit (APU), used to start the aircraft engines. The start appeared normal until ramp personnel informed the crew that the APU was on fire. The APU fire extinguisher was activated, and the passengers were off loaded.

When the fire trucks arrived, the fire had gone out. The right side of the fibreglass tail cone, the right elevator, and paint on the right horizontal stabilizer were damaged by the fire.

The APU had failed to start prior to the previous flight from Toronto and "APU will not start" had been written on the company maintenance irregularity report. The aircraft was dispatched as per the Boeing 737 Minimum Equipment List (MEL) 49-1 which states that an aircraft may operate with the APU inoperative provided the APU panel is placarded "inop" and the affected circuit-breakers are deactivated and collared. However, the APU was not placarded unserviceable as required by company regulations, and the replacement crew at Vancouver decided to make one attempt to start the APU.

Aircraft are on a heading of 045 degrees true when parked at Gate 20. The wind at the time of the accident was recorded as 250 degrees true at 22 knots.

Examination of the APU revealed that the ignitor plug would not function normally because of erosion damage. When the ignitor plug was replaced, the APU started and ran normally.

Because the aircraft was on a quick turn-around in Vancouver, company maintenance had no opportunity to correct the deficiency, and the aircraft was once again dispatched as per the Boeing 737 MEL 49-1.

The APU had not been placarded unserviceable by the Toronto to Vancouver crew as the usual reason for failure to start is temperature related; for this reason, the replacement crew elected to attempt one start. The start appeared normal, but the defective ignitor plug did not ignite the fuel until after fuel mist was blowing out of the APU exhaust. When the mixture ignited, it caused a torch-like flame to blow out the exhaust. The strong wind from the left and the rear of the aircraft blew the flames forward, toward the right side of the empennage, damaging the right elevator and igniting the resin in the tail cone fibreglass. Had it not been for this wind, the APU would probably have torched briefly without causing any damage and then run normally. With the strong wind fanning the burning fibreglass, it continued to burn for a short time after the APU flame disappeared and then went out before the fire trucks arrived.

Had the APU been placarded and the circuit-breakers collared as required by company regulations, the replacement crew in Vancouver would probably not have attempted the start.

CONCLUSIONS:

Findings:

1. When the APU failed to start prior to the last flight, the defect was written up in the maintenance irregularity report, but the APU was not placarded as being inoperative nor were the affected circuit-breakers deactivated and collared.

2. Believing the previous APU start failure was due to the cold temperature in Toronto, the pilot in Vancouver started the APU.

3. A defective ignitor plug delayed the ignition and caused sprayed fuel to torch from the exhaust.

4. The wind blew the flames back onto the aircraft empennage, burning paint and fibreglass.

Causes:

The APU was not placarded and disabled in accordance with company regulations.

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NORTHWEST AIRLINES INC.
BOEING 727-200 N712RC
TORONTO/LESTER B. PEARSON INTERNATIONAL AIRPORT, ONTARIO
24 JULY 1987

BRIEF NUMBER: 87-O/74919 (Incident)
LOCAL TIME: 0730 EDT
OPERATION: Scheduled Air Carrier
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	28,000	1,500
LAST 90 DAYS	60	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	7
PASSENGERS	-	-	80

REPORTED CIRCUMSTANCES:

Northwest Airlines Flight 409 departed from Toronto/Lester B. Pearson International Airport, Ontario destined for Detroit, Michigan. After lift-off from runway 33, the flight crew observed a high exhaust gas temperature (EGT) reading in the number one engine (Pratt & Whitney JT-8D Turbofan) and felt a vibration thoughout the aircraft. The crew elected to shut down and secure the engine in accordance with company procedures and return to the airport. The aircraft made an uneventful landing with emergency equipment standing by and taxied to the gate for passenger deplaning. Local weather conditions at the time consisted of overcast skies at 3,000 feet above ground level, and the visibility was one and one-half miles.

A teardown inspection by the operator revealed damage in the low- power turbine section of the engine. It was determined that the T3 turbine blades, part number 735903, had failed because of either stress rupture or fatigue. Sections of the failed T3 blades moved aft and caused damage to the T4 turbine blades. The internal damage to the engine was confined within the power turbine section with no noticeable damage to the engine case. The total time in service on the engine was 19,192 hours and 11,250 cycles.

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TRANS-PROVINCIAL AIRLINES DHC-3 OTTER C-FRNO PRINCE RUPERT, BRITISH COLUMBIA 09 AUGUST 1987

BRIEF NUMBER: 87-P74088 (Incident)
LOCAL TIME: 1448 PDT
OPERATION: Non-Regular Specific Point
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,000	300
LAST 90 DAYS	275	175

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	6

REPORTED CIRCUMSTANCES:

The pilot was on final approach for a water landing in the amphibious aircraft when he heard a loud bang, and, looking in the mirror, he saw that the left main gear was hanging free. He selected the gear down and, having obtained a down indication, made a landing on wheels at the nearby airport. During the landing roll, the left main gear slowly collapsed, and the aircraft veered gently off the runway.

Examination of the left main wheel shock strut assembly revealed that the four pins, part number A8363, attaching the end and rod assembly to the head-orifice had failed in a progressive mode of failure, allowing the shock strut assembly to pull apart and the wheel to hang down.

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NORTH YUKON AIR LTD. CESSNA 207 SKYWAGON 8 C-GNQW FORT MCPHERSON, NORTHWEST TERRITORIES 28 mi SSW 10 AUGUST 1987

REPORT NUMBER: 87-W70054 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1830 YDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	525	270
LAST 90 DAYS	220	220

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	6

SUMMARY REPORT:

The pilot, accompanied by six foreign tourists, was conducting a sightseeing flight along the Arctic coast. The aircraft departed from Inuvik, Northwest Territories, on a visual flight rules (VFR) flight to Eagle Plains, Yukon, and the pilot indicated on the flight notification that he planned to follow the Dempster Highway. After passing over Fort McPherson, the pilot departed from the highway and attempted to fly direct to Eagle Plains, Yukon. Low cloud was encountered in a pass, and the pilot returned to the highway route. While following the highway through a pass at 300 feet above the road, the pilot encountered cloud which extended to the rising terrain. He then slowed the aircraft to 80 knots and lowered 10 degrees of flap. The pilot then commenced a left-hand 180-degree turn with 20 degrees of bank; the aircraft stalled and struck the ground south of the highway. The aircraft was substantially damaged.

The pilot had received a weather briefing for his intended route; however, the only stations that reported weather for his flight route were Dawson City, Yukon and Fort McPherson, which are, respectively, 300 nautical miles and 60 nautical miles from Inuvik, Northwest Territories. These stations were reporting VFR weather, but the mountainous area where the accident occurred was forecast to have local instrument flight rules (IFR) conditions.

Although the weather appeared to allow a direct route through the pass, the pilot did not realize that the elevation of the terrain was rising and that it was not possible to maintain VFR. The pilot continued VFR flight into adverse weather conditions and was unable to turn around in the space available.

The weather information along the Dempster Highway (a major VFR route) is extremely limited, and adequate coverage within the mountainous area is not provided.

CONCLUSIONS:

Findings:
1. The pilot continued VFR flight into adverse weather conditions.

2. The aircraft struck the ground while the pilot was attempting to turn around.

3. The weather information available along the Dempster Highway route is very limited.

Causes:
The pilot continued VFR flight into adverse weather conditions, and the aircraft struck the ground during the attempt to turn around.

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V. KELNER AIRWAYS LTD.
CESSNA A185F SKYWAGON C-GYBJ
HORSESHOE LAKE, ONTARIO
28 AUGUST 1987

REPORT NUMBER: 87-C70070 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1800 CDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	627	371
LAST 90 DAYS	299	299

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The pilot, with two passengers on board, commenced a take-off from a small lake for a short visual flight rules (VFR) flight to Pickle Lake, Ontario. The aircraft was up on the step when the pilot realized that the distance to the shoreline was insufficient for the aircraft to lift off and climb over the trees, so she decided to reject the take-off. The mixture control was pulled to the idle cut-off position, and, when the pilot realized the aircraft was going to go up on shore, she selected full flap and applied full-up elevator. The aircraft came to rest amongst the small trees and brush, about 75 feet from the shoreline.

The pilot had flown the two passengers to the lake earlier in the day and had taken off without difficulty. Conditions at the time of the second attempt, however, had changed; the aircraft was heavier, there was no wind, and the water was glassy.

The lake that was being used as a take-off area did not provide the distance required for take-off under the conditions that existed at the time.

CONCLUSIONS:

Findings:
1. During the rejected take-off, the aircraft ran up on the shore and came to rest in small trees and brush.

Causes:
The pilot did not reject the take-off in time. The area being used for take-off did not provide sufficient length for the existing conditions.

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BAR HARBOUR AIRLINES
BEECHCRAFT KING AIR 100 N704S
SAINT JOHN AIRPORT, NEW BRUNSWICK
01 SEPTEMBER 1987

REPORT NUMBER: 87-A74971 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1201 ADT
OPERATION: Regular Specific Point
DAMAGE: Nil
PILOT LICENCE: Airline Transport (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	28,000	830
LAST 90 DAYS	240	240

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	8

HISTORY OF THE FLIGHT:

The flight, Bar Harbour 769 (BH 769) which was on an IFR flight plan from Saint John, New Brunswick to Bangor, Maine, had been cleared direct to the Juliett non-directional beacon (NDB), then direct to Bangor. After take-off, the aircraft made a right turn and tracked toward the Saint John beacon. On this track, the aircraft was heading toward the protected airspace of another air-

craft, which had been cleared for an approach to runway 23. BH 769 contacted Moncton Area Control Centre (ACC) on the departure frequency, and he was advised to maintain 280 degrees for radar vectors to Bangor. When the aircraft appeared on radar, at approximately 1,200 feet above ground level (agl), the ACC controller observed that the aircraft was not proceeding as cleared. Positive separation between the two aircraft was assured when BH 769 was established on a heading of 280 degrees by Moncton ACC, and the flight continued to Bangor.

PERTINENT INFORMATION:

When BH 769 was given the IFR clearance, the standard IFR clearance format was used. This format consists of a routing portion, which, in this case, was "ATC clears Bar Harbour seven six nine to the Bangor Airport via Saint John, direct, maintain eight thousand, departure runway two three proceed direct Juliett beacon then direct Bangor, squawk six seven zero one." This IFR clearance was issued by Moncton ACC and the Saint John ground controller relayed the clearance to BH 769. BH 769 read back the clearance as " seven sixty-nine is cleared to the Bangor Airport, Saint John beacon, direct, maintain eight thousand, depart two three to Juliett, and ah then direct Bangor, six seven zero one."

The ground controller responded to the readback by saying " Bar Harbour seven six nine, check on routing, it's just Saint John direct and depart two three, proceed direct Juliett beacon, then direct Bangor." BH 769 replied to this transmission with "okay, seven sixty-nine."

The ground controller then responded with "Bar Harbour seven six nine, readback checks, tower now one one eight five."

ANALYSIS:

The ATC clearance was issued in a standard format; however, the routing portion of the clearance "ATC clears BH 769 to the Bangor Airport via Saint John direct" apparently confused the crew. As indicated by their readback, the crew of BH 769 were not clear in their interpretation of the clearance. They took the clearance to mean they were cleared to the Saint John NDB, direct to the Juliett and direct to Bangor, rather than direct Juliett then direct Bangor.

The ground controller did question BH 769's readback of the clearance, "seven sixty-nine is cleared to the Bangor Airport, via Saint John beacon direct." He did not receive a proper readback of his correction, although he responded to BH 769's answer of "Okay, seven sixty-nine" by replying that the "readback checks." Although the ground controller detected and corrected the error in the readback, he did not ensure that the crew had received the clearance correctly.

FINDINGS:

Cause Related:

1. The flight crew misinterpreted the routing and departure segments of their clearance.

2. After take-off, the flight did not proceed directly to the Juliett NDB as specified in the departure instructions of their clearance but, instead, proceeded toward the Saint John NDB and came into conflict with another aircraft on an IFR approach.

3. The ground controller did not obtain a complete readback on the amended clearance.

4. The ground controller did not ensure that the flight had received the clearance correctly.

Other:

-Nil-

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CONTACT AIRWAYS LTD.
DE HAVILLAND DHC-2-1 BEAVER C-GUJV
GARDINER LAKE, ALBERTA
05 SEPTEMBER 1987

REPORT NUMBER: 87-W70059 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1715 MDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,100	700
LAST 90 DAYS	350	350

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	4

HISTORY OF THE FLIGHT:

The aircraft was being used to fly fishermen between camps on Namur and Gardiner Lakes. The take-off was being made from a river leading into a bay on Gardiner Lake. As the aircraft left the mouth of the river, the pilot attempted to lift off to avoid the rough water on the lake. As the floats were leaving the water, the aircraft began

to roll to the left, and the pilot applied full right aileron. The aircraft veered 90 degrees to the left and struck the tree-covered bank of the bay, 100 feet left of the centre line of the river.

PERTINENT INFORMATION:

The take-off run was directly into wind along an 800-foot-long straight stretch of the river. The wind was from the west at 20 knots and caused moderate waves with white-caps on the lake.

The calculated weight of the aircraft was approximately 200 pounds under the maximum permissible gross weight, and the centre of gravity was within limits. The flight controls were operating normally, and the flaps were set to the take-off position. The engine was producing take-off power until the pilot closed the throttle just prior to the aircraft striking the three-foot-high bank.

The pilot had approximately 700 hours on float-equipped DHC-2 aircraft and estimated that he had landed and taken off from Gardiner Lake at least 50 times.

ANALYSIS:

The pilot lifted off at a minimum airspeed to avoid the rough open water of the lake. The application of full right aileron at minimum airspeed caused the left wing to stall, resulting in a loss of directional control.

CONCLUSIONS:

Findings:

1. The rough open water of the lake was not suitable for a take-off attempt.

2. An 800-foot stretch of river running into the lake was accepted by the pilot as suitable for the take-off attempt.

3. The aircraft lifted off at minimum airspeed to avoid the rough water on the lake.

4. The pilot applied full aileron to level the wings at minimum airspeed.

5. The left wing stalled and the aircraft entered an incipient spin.

Causes:

The pilot's right aileron control input at minimum airspeed caused the left wing to stall and resulted in the loss of control of the aircraft.

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AWOOD AIR LTD.
CESSNA 337D SKYMASTER C-GUAF
SUNSHINE, ONTARIO 3 mi NW
16 SEPTEMBER 1987

REPORT NUMBER: 87-C70077 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1835 EDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	400	150
LAST 90 DAYS	150	150

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	1	1

SUMMARY REPORT:

The charter aircraft was on a visual flight rules (VFR) flight from Red Lake to Thunder Bay, Ontario. Approximately 20 miles from destination, both engines lost power. The pilot attempted to restart the engines, and both engines surged briefly, then lost all power. The pilot selected a highway for landing, but traffic forced him to land to the side of the road. The aircraft struck two hydro poles, causing substantial damage; two of the three occupants were seriously injured.

The fuel tanks had been filled at Thunder Bay prior to departure for the 1 hour and 30 minute outbound flight, and the aircraft was not refuelled at Red Lake. The fuel system was examined at the wreckage site; no fuel was found in the main tanks, and the auxiliary tanks were full. When the fuel lines to the engines were disconnected and the auxiliary tanks selected, fuel flowed freely from the lines. Both fuel selectors were serviceable. All the fuel filters were clean and did not contain fuel. A fuel sample taken from one of the auxiliary tanks was clean and bright. The engines were examined, and no abnormalities were found.

The pilot had very little experience on this model of Cessna 337, but he had been flying a later model of the aircraft throughout the summer. The fuel system and fuel selectors in the later model were different, and both front and rear selector positions were LEFT, RIGHT, and OFF. The fuel system of the accident model had auxiliary tanks, and the fuel selector positions were LEFT, RIGHT, LEFT AUX, and OFF for the front engine, and LEFT, RIGHT, RIGHT AUX, and OFF for the rear en-

gine. The left auxiliary tank supplies only the front engine, and the right auxiliary tank supplies only the rear engine. The pilot believed he had selected the auxiliary tanks during the flight, but he could not be sure.

The main fuel tanks would have contained sufficient fuel for the flight if the mixture had been leaned out. However, the pilot left the mixture controls in the rich setting in accordance with company policy.

Both engines lost power due to fuel starvation because the auxiliary tanks were not selected and the main tanks were allowed to run dry.

CONCLUSIONS:

Findings:
1. The engines lost all power.

2. The main fuel tanks were dry, and the auxiliary tanks were full of fuel.

3. The pilot had very little experience on the occurrence aircraft but had flown another model of the same type, with a different fuel system, extensively prior to the occurrence.

Causes:
The Canadian Aviation Safety Board determined that the engine failure was due to fuel starvation, as a result of the auxiliary tanks not being selected.

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RISK OF COLLISION BETWEEN: DOUGLAS DC-9-32 C-FTMY and CESSNA 180 CF-IQT STEPHENVILLE, NEWFOUNDLAND 16 SEPTEMBER 1987

REPORT NUMBER: 87-A74100 (Incident)
LOCAL TIME: 1526 NDT
INFORMATION SOURCE: Office investigation

DOUGLAS DC-9-32 C-FTMY

OPERATOR: Air Canada
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	N/A	N/A	N/A	N/A
LAST 90 DAYS	N/A	N/A	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	6
PASSENGERS	-	-	34

CESSNA 180 CF-IQT

OPERATION: Private Recreational
DAMAGE: None
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	N/A	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

HISTORY OF THE FLIGHT:

The DC-9 was on an instrument landing system (ILS) approach to runway 28 at Stephenville. At the same time, the Cessna 180, CF-IQT was inbound from the southeast to Noel's Pond, a lake just north of the threshold of runway 28. The Cessna aircraft was not equipped with a radio transmitter but did have a receiver, and the pilot was aware that the DC-9 was on approach. The pilot of the Cessna had not notified the flight service station (FSS) of his intention to fly into the area, and neither the FSS operator nor the pilot of the DC-9 was aware that the Cessna was in the area. The Cessna pilot saw the DC-9 and planned his approach, which required him to cross the approach to runway 28 so that he would pass behind the DC-9. In doing so, he flew toward the

approach area at an altitude below the approach path of the DC-9 and then turned right to parallel the approach path until the DC-9 had passed, after which he turned left, crossed the approach path to runway 28, and completed his approach to the lake. The pilot of the DC-9 reported first seeing the Cessna to his left, and at a slightly lower altitude, in a right turn. At the time, the DC-9 was about 600 feet above ground level (agl). The pilot of the DC-9 reported the occurrence as a near-miss.

PERTINENT INFORMATION:

Stephenville Airport has an FSS and a mandatory frequency for all radio-equipped aircraft within five nautical miles and below 3,084 feet above sea level. In this specified area, all aircraft must have a functioning two-way radio or, in the case of aircraft without functioning two-way radio communication, prior notice must be given to the FSS of their operation.

On approach, the DC-9 had descended through broken cloud, breaking out at about 1,300 feet agl. Below the cloud base, the visibility was unlimited.

The distance between the two aircraft when the DC-9 pilot first saw the Cessna could not be accurately determined. No evasive action was taken.

ANALYSIS:

When the pilot of DC-9 first saw the Cessna, he did not know from which direction the Cessna had flown, nor was he aware that the Cessna pilot had the DC-9 aircraft in sight and was manoeuvring to avoid a conflict. To comply with existing regulations, the Cessna pilot should have given prior notice to the Stephenville FSS of his intention to fly into the area. This would have enabled the FSS operator to inform local traffic of all conflicting traffic in the area.

FINDINGS:

Cause Related:
1. The pilot of the Cessna entered the Stephenville area without a functioning two-way radio and without giving prior notice of his intentions to the FSS.

Other:
-Nil-

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RISK OF COLLISION BETWEEN: BOEING 727 N742 and MCDONNELL-DOUGLAS DC-9 C-FTMP MONTRÉAL/DORVAL INTERNATIONAL AIRPORT, QUÉBEC 22 SEPTEMBER 1987

REPORT NUMBER: 87-H74901 (Incident)
LOCAL TIME: 1450 EDT
INFORMATION SOURCE: Field Investigation

BOEING 727 N742

OPERATOR: Delta Airlines
OPERATION: Scheduled International
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	21,000	9,500	N/A	N/A
LAST 90 DAYS	210	210	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	N/A
PASSENGERS	-	-	N/A

MCDONNELL-DOUGLAS DC-9 C-FTMP

OPERATOR: Air Canada
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	12,000	4,000	N/A	N/A
LAST 90 DAYS	100	100	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	N/A
PASSENGERS	-	-	N/A

HISTORY OF THE FLIGHT:

Delta Airlines Flight 214, a Boeing 727, was inbound to Montréal Dorval Airport from Miami. The flight was provided with radar vectors in anticipation of an approach to runway 24 Right. At a position 4.5 nautical miles east of the airport, the aircraft was cleared for a visual approach to runway 24 Right, with a restriction to intercept the final approach path at 3,000 feet above sea level (asl). At that time, Air Canada Flight 532, a

McDonnell-Douglas DC-9, was cleared for take-off from runway 06 Right on a Dorval Four Standard Instrument Departure. Air Canada 532 contacted the Departure controller upon leaving 2,500 feet asl and was instructed immediately to maintain 2,500 feet asl. The crew questioned these instructions, and the controller then issued instructions to turn left to a heading of 360 degrees magnetic and maintain 2,500 feet asl. The traffic information was issued to Delta 214, and the crew reported Air Canada 532 in sight. The two aircraft passed within 0.6 nautical miles horizontally and 400 feet vertically.

PERTINENT INFORMATION:

The weather reported at 1400 eastern daylight time (EDT) for Dorval was sky condition 4,000 feet scattered, 8,000 feet scattered, 27,000 feet scattered, visibility 15 miles, and wind 240 degrees magnetic at four knots. The weather was essentially unchanged at the time of the occurrence.

Runway 10/28 had been released for maintenance; runway 24 Left was used for departures and runway 24 Right for arrivals. Aircraft located at gates close to the threshold of runway 06 Right (Gates 2 to 5D) usually request a departure on runway 06 Right when the wind is calm, regardless of the runway configuration in use. Air Canada 532 requested and was granted a departure on runway 06 Right, following coordination between the airport and departure controllers.

Noise-abatement procedures for jet traffic at the Dorval Airport call for a maximum allowable rate of climb to 3,000 feet asl. The Dorval Four Standard Instrument Departure for runway 06 Right requires a climb on runway heading to 5,000 feet asl and conforms to all noise-abatement procedures.

The same procedures also specify that all aircraft over 34 000 kilograms making a visual approach must intercept the final approach track at 3,000 feet asl or above.

Delta 214 was operating on the low arrival frequency while Air Canada 532 was cleared for take-off on tower frequency and later changed to the departure frequency. At no time were the two aircraft on the same frequency.

The movement of all flights within the Terminal Control Area must be coordinated between controllers responsible for such flights. The first form of coordination is governed by unit directives to ensure the safe, orderly, and expeditious flow of traffic within the Terminal Control Area. These unit directives describe the applicable procedures when certain runway configurations are in use. When a deviation from these procedures becomes necessary, individual coordination in the form of a verbal exchange of information is mandatory. When coordinating, controllers are not required to provide readbacks or challenge type responses; a simple acknowledgement is acceptable.

There were four controllers working the Terminal Control Area Airspace from four separate working positions. Their physical positions and titles are departure, data, high arrival and low arrival. The departure controller and the low arrival controller were separated by two working positions, a distance of approximately 20 feet.

The departure of Air Canada 532 from runway 06 Right required coordination as this departure was different from the usual runway configuration. Coordination was initiated by the departure controller with both the arrival controllers.

The departure controller informed the high arrival and low arrival controllers of the departure. The supervisor, who was the high arrival controller, acknowledged and heard the low arrival controller acknowledge. The low arrival controller did not recall having acknowledged any coordination.

The low arrival controller subsequently cleared Delta 214 for a visual approach to runway 24 Right, to maintain 3,000 feet asl until established on final. Delta 214 turned left base for runway 24 Right and came into conflict with the departing Air Canada 532.

The Supervisor observed the flight path of Delta 214 and immediately alerted the low arrival and departure controllers. The low arrival controller informed Delta 214 of the position of Air Canada 532 on two separate occasions. The departure controller instructed Air Canada 532 to turn left to a heading of 360 degrees magnetic and maintain 2,500 feet asl. The pilot of Delta 214 reported the traffic in sight and initiated a descent from 3,000 feet asl to 1,700 feet asl. The two aircraft passed within 0.6 nautical miles horizontally and 400 feet vertically of each other; the required separation is three miles horizontally or 1,000 feet vertically.

The incident occurred at a time of shift change when the noise level was normally high.

The workload on the departure sector was moderate and complex, involving aircraft operating under visual flight rules (VFR) and instrument flight rules (IFR). The departure controller was responsible for the movement of several departures from three airports (Mirabel, Dorval and St-Hubert) and several overflights including a test aircraft. The workload on the low arrival sector was light, as Delta 214 was the only aircraft on the frequency.

ANALYSIS:

Because the departure of Air Canada 532 from runway 06 Right represented a deviation from a normal runway configuration, coordination was required between the departure and the arrival controllers, and this was initiated by the departure controller. The high arrival controller acknowledged the request, and the departure controller understood that the request had been acknowledged by the low arrival controller. However, the low arrival controller did not recall having acknowledged any coordination between himself and the departure controller and thus did not take into account the departing Air Canada 532 when issuing the approach clearance to Delta 214.

Although appropriate coordination had been initiated, effective information transfer did not take place, and a serious conflict between the two aircraft developed when Delta 214 turned onto a collision course with Air Canada 532. This conflict required prompt evasive action by the controllers in order to prevent a possible collision.

Avoiding conflict situations in air traffic control operations requires effective coordination. Effective coordination in turn relies upon effective information transfer. Both human factors and system factors can contribute to information transfer being impeded, as well as other variables.

Problems in information transfer, particularly with respect to voice communications, are frequently cited as factors in air traffic control conflicts. In the "Report on a Special Investigation into the Risk of Collisions Involving Aircraft at or Near the Ground at Canadian Airports" published in 1987 (Report 87-SP001) the Canadian Aviation Safety Board found that the breakdown in information transfer was a factor in a significant number of ground conflict situations.

In this case, it was not possible to determine the precise reason for the breakdown in the information transfer process. No equipment deficiencies were reported and staffing at the Area Control Centre and Terminal Sector was compatible with the workload. Nevertheless, missed or misunderstood messages are common problems in the information transfer process. It is apparent that, in this case, such a breakdown occurred, and the arrival controller was not aware of the departing Air Canada 532.

When coordinating with each other, controllers are not required to provide readbacks or challenge type responses to requests, a simple acknowledgement being acceptable; however, in a terminal environment where four or five controllers communicate verbally on hot lines, radio frequencies, telephones and face to face, all within a space of 15 to 20 feet, a simple acknowledgement to one request may be taken as the reply to a request from another individual.

CONCLUSIONS:

Findings:

1. The departure of Air Canada 532 from runway 06 Right with traffic arriving on 24 Right was not a standard runway configuration, and, as a result, coordination was required between the departure and arrival controllers.

2. Appropriate coordination was initiated by the departure controller with the high arrival controller and the low arrival controller.

3. The low arrival controller was heard to acknowledge but did not recall having acknowledged the coordination.

4. Effective information transfer and coordination did not take place between the departure controller and low arrival controller. Thus, the low arrival controller allowed the arriving Delta 214 to turn onto what was a collision course with the departing Air Canada 532.

5. Staffing at the Area Control Centre Terminal Sectors was compatible with the workload.

6. No equipment deficiencies were reported that could have had a bearing on this occurrence.

Causes:

The cause of this occurrence was inadequate co-ordination between the departure and arrival air traffic controllers.

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CLUB CESAR INC.
DE HAVILLAND DHC-2 MK1 BEAVER C-GADD
CLOVA, QUÉBEC 10 mi SE
29 SEPTEMBER 1987

REPORT NUMBER: 87-Q70045 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1750 EDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,200	3,975
LAST 90 DAYS	275	275

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	4

SUMMARY REPORT:

The pilot and four passengers were on a visual flight rules (VFR) flight and were returning to the main lodge after a hunting trip. After encountering deteriorating weather conditions and restricted visibility, the pilot elected to carry out a precautionary landing on a small lake. The aircraft landed hard, damaging the float support structure, and then swerved uncontrollably and struck the shoreline. The occupants were not injured.

There were no reported aircraft malfunctions prior to the occurrence. The weather in the area consisted of a ragged ceiling below 1,000 feet above ground level (agl) with visibilities varying from three-quarters to three miles, in showers. Isolated embedded storm cells caused heavy showers and further reduced the visibility. A short time before the accident, the pilot had flown along the same route on his way to pick-up the passengers, and the weather conditions had been similar to the conditions encountered on the return flight.

The pilot decided to execute a 180-degree turn when the visibility decreased as the frequency of showers increased. During the turn, the aircraft entered an area of heavy precipitation, where the only visual reference was vertical. The pilot noticed that they were passing over a small lake and, rather than risk continued flight into poor conditions, he decided to land.

A hurried approach in substantially reduced visibility conditions degraded visual cues and resulted in a hard landing.

CONCLUSIONS:

Findings:

1. The VFR flight was attempted into an area of marginal weather conditions.

2. The aircraft entered weather conditions unsuitable for continued flight.

3. The pilot performed an approach in visibility conditions which severely hampered outside visual references, and the aircraft landed hard.

4. The pilot was unable to maintain directional control of the aircraft following the landing, and the aircraft struck the shore.

Causes:

The flight was continued into unsuitable weather conditions, necessitating a precautionary landing.

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PACIFIC RIM AIRLINES LTD.
DE HAVILLAND DHC-2 BEAVER C-FJPX
AHOUSAT, BRITISH COLUMBIA
05 OCTOBER 1987

BRIEF NUMBER: 87-P70087 (Accident)
LOCAL TIME: 0930 PST
OPERATION: Specific Point Commercial
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,064	134
LAST 90 DAYS	291	75

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot planned to step-taxi from the dock to the take-off area; the line of taxiing was to be between a marker buoy on the left and a boat on the right. After take-off power was applied and with the water rudders up, the aircraft started to swing to the left. The pilot applied full right rudder, but the aircraft continued to swing, so the pilot closed the throttle. The aircraft was coming off the step when it struck the buoy, and a large hole was torn in the left float. After the pilot and passengers evacuated the aircraft, it rolled over and sank to the floats. The wind was light at the time of the occurrence.

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FLYWEST AIR LTD.
CESSNA U206F STATIONAIRE C-GXZV
DEASE LAKE, BRITISH COLUMBIA 10 mi SW
06 OCTOBER 1987

BRIEF NUMBER: 87-P70088 (Accident)
LOCAL TIME: 2025 PDT
OPERATION: Commercial
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,600	200
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was on a visual flight from Atlin, British Columbia to Dease Lake. As he neared his destination, he encountered snow showers. He diverted south toward Telegraph Creek and encountered rapidly deteriorating weather which caused him to fly at tree-top height and to strike trees several times; as well, it was getting dark. After about 45 minutes of flight in darkness, the pilot elected to land on a road. He was about to touch down when the passenger pulled back on the control wheel. The aircraft ballooned into the air, then fell back to the ground, out of control. The aircraft came to rest against trees at the side of the road.

The pilot further reported that the artificial horizon, the instrument lights, and the starboard navigation light were unserviceable during the flight. The accident took place over one hour past official night time.

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HAWK AIRWAYS
DE HAVILLAND DHC-2 MKI BEAVER C-GOZR
MOZAMBIK LAKE, ONTARIO
09 OCTOBER 1987

REPORT NUMBER: 87-O/70077 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1330 EDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,200	2,000
LAST 90 DAYS	150	140

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	1	1

HISTORY OF THE FLIGHT:

The float-equipped aircraft was on a visual flight rules (VFR) charter flight transporting a party of hunters and their equipment from an outpost camp on Weginabikum Lake to the company main base at Hawk Junction. En route, the pilot encountered deteriorating weather in the form of snow showers and commenced a series of turns to avoid the weather. During these turns, at an altitude of 500 to 600 feet above ground level (agl), the aircraft descended, struck trees, and came to rest on its left side in bush-covered terrain. The passengers were able to exit the aircraft on their own and assisted the injured pilot in getting out. The emergency locator transmitter (ELT) activated automatically on impact, and the signal was detected by an overflying airliner and by the Search and Rescue Satellite (SARSAT). A SAR helicopter in the area, en route to Thunder Bay, was able to home in on the ELT signal, locate the wreckage, and transport the victims to Wawa; here they were admitted to hospital some four hours after the accident.

PERTINENT INFORMATION:

The aircraft's calculated gross weight of 5,048 pounds at the time of the accident placed the aircraft near its maximum gross weight of 5,090 pounds, with the centre of gravity within prescribed limits.

No mechanical failures or malfunctions of the aircraft components or systems were found that would have contributed to the accident.

When the accident occurred, the aircraft was flying over hilly terrain; the ceiling was at 300 to 500 feet, and the visibility was at times down to one half to one mile in snow showers. The pilot was familiar with the area.

The tree impact marks on the leading edges of the wings indicated that the aircraft was banked approximately 60 degrees to the left at the time of initial impact with the trees. An angle of bank of 60 degrees increases the stalling speed of this aircraft type from 60 to 105 mph.

ANALYSIS:

When the pilot encountered the heavy snow showers, he attempted a 180-degree turn as he knew he was in a hilly area. He inadvertently allowed the bank angle to increase during the turn, and the aircraft stalled and descended out of control.

CONCLUSIONS:

Findings:
1. The pilot encountered marginal weather conditions and attempted to make a 180-degree turn.

2. During the turn, the pilot banked the aircraft steeply, and it stalled.

3. The aircraft descended out of control and struck trees.

4. A serviceable, functioning ELT on board the aircraft resulted in rapid rescue of the injured pilot and passengers.

Causes:
The pilot banked the aircraft too steeply, and it stalled.

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BROOKER WHEATON AVIATION LTD.
BEECHCRAFT B-100 KING AIR C-GBWF
LITTLE CADOTTE RIVER STATION AIRSTRIP,
ALBERTA
26 OCTOBER 1987

REPORT NUMBER: 87-W70070 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1330 MST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	5,400	800	1,700	75
LAST 90 DAYS	150	100	125	70

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	5

HISTORY OF THE FLIGHT:

During the landing at a private airstrip at Little Cadotte River Station, Alberta, the aircraft touched down heavily on the gravel upslope at the approach end of runway 30. The aircraft bounced, and the left main wheel assembly and piston separated from the landing gear. The aircraft then continued down the runway on the right main wheel and nosewheel. As the speed decreased, the left wing lowered, the left propeller struck the runway surface, and the aircraft swerved off the runway.

PERTINENT INFORMATION:

The airstrip was situated on a pipeline right-of-way and was about two feet higher than the surrounding muskeg. The runway was designated 30/12 and was 2,500 feet long. A pumping station was located to the left and beside the departure end of runway 30. A runway overrun was adjacent to, and extended beyond, the pumping station. The first 20 feet of the approach end of runway 30 had an upslope of between four and five and one-half degrees. The runway condition was dry with a hard-packed gravel surface. The width of the runway was marked by two parallel rows of barrels; however, the threshold of runway 30 was not clearly delineated, nor was it required to be under present regulations. The airstrip was privately operated, and the aerodrome information was not published in the Canadian Flight Supplement, nor was it required to be.

The pilot had not landed on this airstrip before. Information provided by his company and a local pilot led the captain to believe that the runway length to the pumping station was 3,000 feet, rather than 2,500 feet. After conducting an aerial inspection of the strip, the captain elected to land as short as possible on the end of runway 30 and to roll out using minimum reverse thrust because of the gravel. He did not realize that his targeted touchdown zone on the end of the runway sloped up and was unsuitable for landing.

During the landing, both main wheels touched down on an upslope about six feet from the end of the runway and left deep tire imprints. The right main wheel touched down on a four-degree upslope and the left on a five- and one-half-degree upslope.

The wheel assembly and piston were secured inside the landing gear by a threaded piston retainer. The retainer, together with the wheel assembly and piston, was found beside the runway, and the threads in the retainer were stripped. Examination by the CASB Engineering Laboratory determined the damage to be material overload caused by the piston rebound driving the piston retaining nut out of the landing gear.

ANALYSIS:

The impact of landing on the five- and one-half-degree upslope was sufficient to cause rapid compression of the left wheel assembly and piston. As the aircraft bounced, the wheel assembly and piston rebounded outward with sufficient force to drive the piston retainer out of the landing gear assembly. The four-degree upslope on the right side was not sufficient to cause abnormal loading, and the right gear remained intact.

Since the threshold of the runway was not clearly delineated, the pilot believed the entire gravel surface of runway 30 to be usable and was not aware of the upslope on the approach end of the runway.

CONCLUSIONS:

Findings:

1. There was no published information on the private airstrip available to the crew.

2. The threshold of runway 30 was not clearly marked.

3. The aircraft touched down heavily because of an upslope on the runway.

4. The left wheel assembly and piston separated, causing the aircraft to swerve off the runway.

Causes:
The pilot landed on an upslope portion of the runway which resulted in abnormal loading of the left main landing gear.

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NORTHWAY AVIATION LIMITED
CESSNA U206C STATIONAIR C-GMJP
BERENS RIVER, MANITOBA 23 mi ESE
03 NOVEMBER 1987

REPORT NUMBER: 87-C70087 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1051 CST
OPERATION: Regular Specific Point
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,810	1,100
LAST 90 DAYS	170	55

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	4

SUMMARY REPORT:

Fifteen minutes after take-off on a scheduled flight from Berens River to Little Grand Rapids, Manitoba, a loud noise was heard from the engine. The oil pressure began to decrease, accompanied by loss of power and engine vibration. After unsuccessfully trying to restore engine power, the pilot selected a landing site, shut the engine down, and carried out a forced landing on a marshy dried creek bed. The aircraft was substantially damaged during the landing.

An examination of the high-time engine (Continental IO-520-F-3A) revealed that the number one cylinder connecting rod was bent and broken at mid-beam. It had become detached from the crankshaft journal and was found lying in the oil pan; the crankcase and oil pan were punctured. Some discoloration was noticed on the number one cylinder crankshaft journal, the connecting rod bearing, the piston pin and the piston pin bearing; the discoloration was from overheating due to inadequate lubrication. No pre-occurrence fault could be found in the engine oil system which could explain the lack of lubrication.

The failed parts were forwarded to the CASB Engineering Laboratory for analysis. It was determined that the failure sequence commenced with the connecting rod bearing, which became extruded and fragmented. The connecting rod cap then failed and released the connecting rod from the crankshaft. The crankshaft connecting rod journal struck the loose connecting rod, causing it to fracture. The engine lost power as a result of the internal damage. The parts punctured the crankcase and oil pan which resulted in the loss of oil and oil pressure.

It could not be determined whether the lack of lubrication occurred previously or during the failure sequence. The cause of the bearing failure could not be determined.

CONCLUSIONS:

Findings:
1. The number one cylinder connecting rod bearing failed.

2. The engine lost power due to internal damage originating at the number one cylinder connecting rod bearing.

3. The connecting rod bearing showed signs of overheating.

4. The pilot made a forced landing.

Causes:
The number one cylinder connecting rod bearing failed, resulting in internal engine damage, loss of oil, and subsequent engine failure. The cause of the bearing failure could not be determined.

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NORTHWINDS NORTHERN INC.
CESSNA 185F SKYWAGON C-GNHU
PIKWITONEI, MANITOBA
04 NOVEMBER 1987

BRIEF NUMBER: 87-C70088 (Accident)
LOCAL TIME: 0935 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,421	228
LAST 90 DAYS	142	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot landed the tail-wheel-equipped aircraft in a 90-degree cross-wind at 10 knots. As the tail was coming down following touchdown, a gust of wind caused the aircraft to veer off the runway. The pilot applied full rudder and differential brake but was unable to regain directional control. The aircraft struck a ditch, and the landing gear broke away from the aircraft.

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R.N.D. AVIATION LIMITED
CESSNA A185F SKYWAGON C-GBFT
SOUTH INDIAN LAKE AIRPORT, MANITOBA
06 NOVEMBER 1987

REPORT NUMBER: 87-C74099 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1147 CST
OPERATION: Charter
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,450	N/A
LAST 90 DAYS	192	192

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

During the landing roll, the aircraft's left landing gear leg broke off just above the axle. The aircraft came to a stop facing 90 degrees to the landing direction.

The landing gear leg had fractured through the top two axle attachment bolt holes. Metallurgical examination of the fractured surface revealed a very small fatigue pre-crack area in the vicinity of one bolt hole; the pre-crack area was about 0.1 per cent of the total area of the fracture surface.

CONCLUSIONS:

Findings:
1. The left landing gear leg fractured though the upper two axle attachment bolt holes.

2. The fracture was due to a small fatigue pre-crack in the vicinity of one of the bolt holes.

Causes:
The left landing gear leg fractured due to a fatigue pre-crack.

SAFETY ACTION:

Action Taken:
On 19 June 1987, the CASB forwarded an Aviation Safety Advisory to Transport Canada concerning the recurrence of Cessna 185 landing gear problems. Transport Canada issued a Service Difficulty Advisory 87-10 (09 December 1981) recommending that owners/operators of Cessna 185 review and adhere to the precautions provided in N-AME-AO 14/81 (03 July 1981).

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AQUILA AIR LTD.
PIPER PA-23-250 AZTEC C-FJAI
CLOWHOLM LAKE, BRITISH COLUMBIA
08 NOVEMBER 1987

BRIEF NUMBER: 87-P70095 (Accident)
LOCAL TIME: 1645 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	626	138
LAST 90 DAYS	138	138

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	4

REPORTED CIRCUMSTANCES:

The aircraft touched down within the first 400 feet of the 2,133-foot gravel runway at 80 knots. Shortly after, the left brake lost pressure and was ineffective. As the aircraft neared the end of the airstrip, the pilot applied right brake and swung the aircraft off the runway into a soft sandy clearing. The nosewheel collapsed, allowing the propellers and the nose to contact the ground.

The pilot reported that the left brake pads appeared to be worn to the rivets and the brake disc was grooved.

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RISK OF COLLISION BETWEEN:
PIPER PA-31-350 C-GZNB and
BOEING 727 N2820W
VANCOUVER INTERNATIONAL AIRPORT,
BRITISH COLUMBIA 8 mi W
15 NOVEMBER 1987

REPORT NUMBER: 87-P74127 (Incident)
LOCAL TIME: 1155 PST
INFORMATION SOURCE: Field Investigation

PIPER PA-31-350 C-GZNB

OPERATOR: Burrard Air
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,000	120
LAST 90 DAYS	200	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

BOEING 727 N2820W

OPERATOR: Delta Airlines
OPERATION: Scheduled International
DAMAGE: None
PILOT LICENCE: Airline Transport (U.S.A.)
PILOT HOURS:

	CAPTAIN		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	15,550	8,400	N/A	N/A
LAST 90 DAYS	160	160	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	7
PASSENGERS	-	-	15

HISTORY OF THE FLIGHT:

The Piper Navajo, Burrard 252, departed Vancouver on an instrument flight rules (IFR) flight to Campbell River, British Columbia. The pilot had requested 6,000 feet as his cruising altitude; however, after take-off, he was given a radar vector by air traffic control (ATC) and was directed to maintain 3,000 feet. He was told to expect a higher altitude 10 miles farther along track. The ATC controller then issued a clearance to Burrard 770, another aircraft which had departed Vancouver a few minutes earlier, to climb to 6,000 feet. The pilots of Burrard 770 and Burrard 252 simultaneously read back

the clearance to ATC; the ATC controller, however, only acknowledged the read-back by Burrard 770. A short time later, Burrard 252 reported level at 6,000 feet and ATC immediately instructed the pilot to descend to 3,000 feet. A Delta Airlines Boeing 727, inbound to Vancouver from the south and descending through 6,000 feet, was directed to turn away from the Navajo to avoid a collision.

PERTINENT INFORMATION:

Both aircraft were in cloud at the time of the incident, and both were being operated in accordance with the instrument flight rules. The pilots and the ATC controller were licensed and qualified. Both aircraft were equipped with transponders; however, the Navajo's transponder altitude encoding unit was unserviceable, and the aircraft's altitude did not register on the ATC controller's radar scope.

The ATC clearance instructing Burrard 770 to maintain 6,000 feet was a valid clearance, and it was properly worded. This clearance was acknowledged by the pilots of both Burrard 770 and Burrard 252; however, ATC received only the acknowledgement by the pilot of Burrard 770 and a background squeal. The controller acknowledged the read-back by the pilot of Burrard 770 by transmitting the flight's call-sign "Burrard 770." The pilot of Burrard 252 stated that the radio reception in his aircraft was not clear at the time of the occurrence and that he thought he had heard the controller acknowledge his transmission.

ANALYSIS:

The pilots of both Burrard flights acknowledged the clearance to maintain 6,000 feet; however, a background squeal on the ATC controller's radio was the only indication that both pilots had transmitted at the same time. Only the transmission by Burrard 770 was heard by the ATC controller, and the controller responded with the flight's call-sign. The pilot of Burrard 252 acted on the clearance because he thought he had heard his radio call-sign and because he was expecting to be cleared to a higher altitude.

Because Burrard Air 252's altitude encoding unit was not registering the aircraft's altitude on the radar scope, the ATC controller was unaware that the flight had left 3,000 feet until the pilot reported at 6,000 feet. The altitude encoder had recently been repaired; however, it was not determined why the unit was not operating. The ATC radar was displaying altitude information for other aircraft in the area at the time of the occurrence.

CONCLUSIONS:

Findings:

1. The pilot of Burrard 252 acted on a clearance issued to Burrard 770.

2. The ATC radar did not receive altitude information from the aircraft's transponder.

Causes:

The pilot of Burrard 252 acted on a clearance that was intended for another aircraft. The aircraft's altitude encoding unit was unserviceable, and the altitude was not displayed on the radar scope.

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AVIATION AMOS M & J INC.
PIPER PA-23-250 AZTEC C-GEYD
MATAGAMI, QUÉBEC 62 mi NW
17 NOVEMBER 1987

REPORT NUMBER: 87-Q70055 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1320 EST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,120	300
LAST 90 DAYS	150	150

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	5

HISTORY OF THE FLIGHT:

The aircraft was on an IFR flight plan from Kuujjuarapik, Québec to Némiscau, Québec, with six persons on board. At an altitude of 8,000 feet above sea level (asl), the pilot changed his destination to Matagami, Québec; he wanted to refuel because the winds at 8,000 feet were stronger than anticipated. After three hours of flight, the pilot, unsure of his position, initiated a descent to continue the flight under VFR. The aircraft was flying at low altitude toward the non-directional beacon (NDB) at Matagami when both engines stopped. The pilot declared an emergency shortly before the engines stopped. Search and Rescue was notified, and an aircraft and a helicopter were dispatched to the area. The pilot force-landed the aircraft wheels-up, in a marshy area approximately 60 miles from Matagami. None of the occupants was injured. The pilot manually activated the ELT (Narco

10-C), and the search and rescue helicopter arrived at the site a few hours later.

PERTINENT INFORMATION:

The pilot planned a 1 hour and 40 minute flight to Nemiscau, with 3 hours and 45 minutes of fuel on board. During the flight, there were several exchanges with passengers and with flight service stations (FSSs) to check the weather conditions in the area. While flying over the VOR at La Grande, the pilot changed his destination to Matagami, his alternate airport. He estimated that the flight would take 1 hour and 40 minutes. The pilot then checked his navigation chart and mistook the data relating to the La Grande VOR outbound radial for the distance to Matagami. The pilot therefore put the aircraft on a heading of 235 degrees rather than 198 degrees which was the correct heading for Matagami. The pilot, waiting to receive signals from the Matagami NDB, maintained this outbound radial for 1 hour and 45 minutes. He did not use the other navigational aids available to confirm his position or to verify his heading en route.

Approximately two hours after leaving La Grande, the pilot identified the Matagami NDB; at that time, the VOR indicated 90 degrees to the left. Unsure of his position, the pilot turned toward Matagami and began descending to continue flying VFR.

He descended gradually to 3,000 feet asl but did not encounter VFR conditions. He tried to contact the FSSs in the area but was unsuccessful. He finally established radio contact with an aircraft flying at high altitude over the same area. All messages were relayed to the Montreal Centre.

Aware that his fuel was running out, the pilot continued his descent to 1,300 feet asl. At that altitude, he was in VFR conditions, but he did not recognize the terrain. Some time afterward, with the auxiliary fuel tanks empty, the pilot switched to the main tanks and declared an emergency. After more than 3 hours and 45 minutes of flight, the aircraft's fuel supply was exhausted, and the pilot carried out the forced landing.

An examination of the aircraft's systems revealed no deficiencies with the engines. The main and auxiliary fuel tanks were filled to capacity, and the engines started and ran normally.

ANALYSIS:

The pilot mistook the outbound radial from the La Grande VOR for the distance to Matagami, causing him to deviate from the correct course by 37 degrees. He did not use the various navigational aids along his route to check the aircraft's position and verify the heading; had he done so, he would have realized his error and taken the correct heading for Matagami. Further, while flying over the La Grande VOR, the pilot was distracted by radio messages and discussions with his passengers. After more than 3 hours and 45 minutes of flying time, the engines stopped because of fuel exhaustion.

CONCLUSIONS:

Findings:

1. The pilot mistook the outbound radial for the distance to Matagami.

2. The pilot did not verify his navigation en route.

3. While flying over the La Grande VOR, the pilot was distracted by radio messages and discussions with passengers.

4. The engines stopped because of fuel exhaustion.

Causes:

The pilot mistakenly followed the outbound radial from the La Grande VOR and did not to verify the aircraft heading en route.

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SIMPSON AIR LTD.
CESSNA A185F SKYWAGON C-GZIX
CREEK BEND JUNCTION, NORTHWEST TERRITORIES
23 NOVEMBER 1987

BRIEF NUMBER: 87-W70078 (Accident)
LOCAL TIME: 1200 MST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,400	350
LAST 90 DAYS	300	100

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was requested by the company to take a charter with one passenger to the Creek Bend Junction. The airstrip there had not been snow ploughed, so it was suggested by the dispatcher that the highway would be

suitable for landing. The pilot overflew the highway and noted that it had been ploughed.

The pilot selected full flaps and landed on the highway in a three-point attitude. On the landing roll, the aircraft started to swerve to the right. The pilot applied left rudder, brake, and power, but this aggravated the situation. The pilot then shut down the engine. The aircraft went off the right side of the highway and into the ditch where it nosed over.

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LATHAM ISLAND AIRWAYS LTD.
CESSNA 185 SKYWAGON C-GUSO
YELLOWKNIFE, NORTHWEST TERRITORIES
60 mi NE
25 NOVEMBER 1987

BRIEF NUMBER: 87-W70079 (Accident)
LOCAL TIME: 1545 MST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,900	500
LAST 90 DAYS	238	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The pilot landed the ski-equipped aircraft on a small lake and picked up three passengers. During the subsequent take-off run, the acceleration was normal; however, just prior to achieving lift-off speed, the aircraft traversed an area of overflow and slush, causing the speed to reduce. The pilot, realizing that there was insufficient distance remaining on the lake surface, rejected the take-off. The aircraft ran onto the shore and came to rest in a small creek.

The occurrence took place at dusk in dim light. The sky was overcast, and the visibility was about two miles in light snow. The snow on the lake surface was deeper than the pilot had expected it to be.

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DE HAVILLAND DHC-2 BEAVER C-GDCJ
VISOR CREEK, BRITISH COLUMBIA
28 NOVEMBER 1987

REPORT NUMBER: 87-W70083 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1530 PST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,648	235
LAST 90 DAYS	190	65

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The take-off was the pilot's second attempt to depart from the 1,400-foot ski strip. The aircraft became airborne at an airspeed of 55 mph and with one third of the strip remaining. The flight continued a few feet above the ski strip until the aircraft overflew a 30-foot ravine which crossed the departure end of the runway at 90 degrees. The aircraft then settled and hit tree-tops; the airspeed had increased to about 70 mph by this time, and the pilot was able to turn toward a clear area and continue to his destination. After landing, small pine branches were found in the left ski cables and the bottom of the fuselage had been substantially damaged.

The pilot reported that the weather at the time of the accident was clear and calm. The ski strip was at an elevation of 3,400 feet above sea level (asl) and was covered by eight inches of snow which had been packed by using snowshoes. The aircraft was 165 pounds under gross weight at the time of departure.

The pilot reported that, after the aircraft became airborne, he lowered the nose down to maintain altitude and gain airspeed, but, as he crossed the ravine at the end of the airstrip, the aircraft lost altitude, either as a result of coming out of ground effect or due to a downdraft, and hit the trees. The aircraft became airborne at marginal flying speed. When the aircraft was over the ravine and out of ground effect, the aircraft was at too low an airspeed to climb and avoid the trees.

CONCLUSIONS:

Findings:
1. The aircraft settled either as a result of coming out of ground effect or due to a downdraft.

2. The pilot could not recover sufficiently to avoid hitting the trees.

Causes:
The pilot attempted to take off from marginal runway conditions.

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WILDERNESS AIRLINES (1975) LTD.
BRITTEN-NORMAN ISLANDER C-GOMC
MISSING
04 DECEMBER 1987

REPORT NUMBER: 87-P70102

	Pilot-In-Command
Pilot Licence	Airline Transport
Total Flying Time	5,360 hr
Total on Type	177 hr
Total Last 90 Days	145 hr

Injuries	Crew	Passengers	Others	Total
Fatal	1	3	-	4
Serious	-	-	-	-
Minor/None	-	-	-	-
Total	1	3	-	4

HISTORY OF THE FLIGHT:

The Britten-Norman BN2A-26, Islander aircraft, C-GOMC, departed Bella Coola, British Columbia at 0947 Pacific standard time (PST), 04 December 1987. The pilot and three passengers were on a visual flight rules (VFR) charter flight to Campbell River. With a forecast of deteriorating weather, the pilot flight planned to follow an established VFR mountain valley route extending south along the Kleena Kleene drainage system toward the destination.

Following departure on runway 04, the aircraft climbed on an easterly heading before turning south. Sixteen minutes after take-off, the pilot called the company flight following in Bella Coola and advised that he was established at an en route altitude of 12,500 feet above sea level (asl) and that his estimated time of arrival (ETA) in Campbell River was 1125 PST. He stated that the sky condition in which he was flying was clear.

Approximately one-half hour into the flight, the pilot contacted a Beech King Air aircraft operated by the same company which was on an instrument flight rules (IFR) flight from Campbell River to Bella Coola at 22,000 feet asl. The King Air crew provided a weather report to the Islander and indicated that high scattered cloud conditions existed within a 50-mile radius northeast of Campbell River and that the outside air temperature (OAT) at their altitude was minus 33 degrees Celsius. The Islander pilot asked the King Air pilot if icing was evident and was advised that the low ambient temperature at altitude made icing conditions unlikely. The last known radio transmission from the Islander pilot was to the King Air crew informing them that he was climbing to 14,000 feet asl. The Islander did not arrive at destination, and search coordination activities were initiated in accordance with the National Search and Rescue Manual procedures. The aircraft has not been found, and the occupants are presumed dead.

PERTINENT INFORMATION:

Approximately 22 minutes after the Islander departed Bella Coola, the Holberg Radar Station, located on northern Vancouver Island, began to receive a code 1200 transponder return. The initial target was 119.6 nautical miles on a bearing of 44.3 degrees magnetic from the radar site. The Islander was equipped to transmit on a code of 1200, and it is standard practice to use this code when conducting VFR flights at altitudes below 10,000 feet. The distance along the flight-planned route between the point of departure and the location of the first radar target is approximately 40 miles. It would have taken the Islander approximately 23 minutes to reach the point at which the first radar target appeared.

The radar target moved 15 miles in a south-southeast direction from the point of initial sighting at a ground speed of approximately 90 knots. The target then turned east, and, about one minute later, it disappeared. A radar target appeared eight minutes later, 17 miles east of the point where the target had disappeared. This target tracked southerly for the next 24 minutes. The last radar sighting was at 1050 PST, when the target was less than one mile north of the summit of Mount Waddington, which is 13,104 feet asl.

It was established during the search that an aircraft has to be at an altitude of approximately 12,500 feet asl for reliable reception of a transponder signal along the latter portion of the plotted radar track.

In strong wind conditions, air moving across a range of mountains may set up vertical undulating air currents or mountain wave action on the lee side of high terrain. As outlined in Transport Canada's publication "Weather Ways", mountain waves present certain hazards to aviation including strong downdrafts, turbulence, horizontal wind shear, icing, and altimeter errors.

The downdrafts and turbulence generated in a mountain wave are pronounced along the downwind slope of the mountain and are potentially most severe at a height equal to that of the summit. Downdrafts exceeding

2,000 feet per minute (ft/min) are not uncommon and can exceed the climb performance capability of a light twin-engined aircraft. Given the conditions in which the Islander is believed to have been flying, its maximum rate of climb at the best rate of climb speed would not have exceeded 300 ft/min assuming an aircraft gross weight of 5,700 pounds.

When flying through a mountain wave system, considerably greater wind speeds will be experienced at the crests than in the troughs of the waves. Wave action is strongest close to the mountain and results in larger wind speed changes between the troughs and crests. These wind speed differentials can have a significant effect on the pilot's ability to maintain a desired track.

Mountain waves tend to intensify icing conditions. The strong vertical currents associated with a mountain wave are capable of sustaining large droplets and would help to account for the moderate to severe mixed icing indicated in the forecast.

Altimeter readout errors can occur due to mountain wave activity and non-standard temperature for a given altitude and when the altimeter setting does not reflect that of the surrounding air pressure.

In accordance with Bernouilli's principle, air pressure decreases as the velocity of the air increases. Thus, the altimeter will read too high when flying through the crest of a wave, especially when the wave is close to a mountain. Altimeter errors of 1,000 feet due to mountain wave activity are not uncommon.

When flight is conducted from an area of high atmospheric pressure to an area of lower pressure, actual height above sea level will decrease for a given indicated altitude, provided that the altimeter setting remains unchanged.

The Environment Canada Surface Analysis Weather Map and the altimeter settings for the place of departure and intended landing indicate a very gradual rise in pressure along the route the day of the occurrence.

The pressure altimeter reading is calculated to indicate true altitude in International Standard Atmosphere (ISA) conditions. An altimeter error can exist as a function of temperature. The amount of error depends on the degree to which the average temperature of a column of air between an aircraft and the ground differs from that of a standard atmosphere air column. If the temperature of the air column in which an airplane is flying is colder than standard air, the true or actual altitude of the airplane will be lower than the indicated altitude.

The Islander is an unpressurized aircraft and was not equipped with oxygen. In accordance with Air Navigation Order (ANO) Series II No.9 respecting aircraft oxygen equipment, "no person shall fly an aircraft for more than 30 minutes at a cabin pressure altitude between 10,000 and 13,000 feet above mean sea level (msl), or at a cabin pressure altitude above 13,000 feet above msl, unless each flight crew member on duty is continuously wearing and using an oxygen mask supplying oxygen."
Sixteen minutes after take-off, the pilot reported that he was at 12,500 feet asl and about 30 minutes after take-off he informed the King Air crew that he was climbing to 14,000 feet. The radar returns of the aircraft were recorded for about another 30 minutes following this last radio call.

ANALYSIS:

Until the aircraft is located, many major areas of the investigation cannot be completed, nor can the cause of the accident established. However, a number of factors based on the available information were examined and the analysis focused on these in an attempt to better understand the circumstances of the disappearance of the aircraft.

The time at which the first transponder return was recorded correlates almost exactly with the estimated time required for the Islander to reach that point. The aircraft's reported altitude coincides with the altitude necessary for transponder signal reception by the Holberg Radar Site. The course and ground speed reflected in the radar plot is generally consistent with a track to Campbell River. The transponder code of 1200 is the code that should have been used had the pilot followed his initial VFR valley routing to destination. These observations support the probability that the monitored target was that of the Islander. They also reveal that the pilot did not follow his flight planned VFR route.

On one of the search flights following the disappearance of the Islander, it was established that an aircraft altitude of 12,500 feet asl is required for reliable reception of a transponder signal along the latter portion of the radar-plotted track.

When the radar target was less than one mile from the summit of Mount Waddington, the transponder return disappeared from the Holberg Radar, and there were no further transponder returns recorded. The signal could have been interrupted for several reasons. The pilot may have turned the transponder off, the transponder may have suddenly become unserviceable, the aircraft may have descended to a lower altitude or flown behind high terrain, or the aircraft may have struck Mount Waddington.

Weather data indicates that solid cloud conditions with tops at 14,000 feet prevailed over the coastal mountains along the route. This condition likely encouraged the pilot to climb to his reported en route altitude of 14,000 feet in order to remain clear of cloud where icing could be encountered.

The area forecast indicated that cumulonimbus cloud, topped at 21,000 feet, would develop because of onshore upslope air flow. Mount Waddington and surrounding terrain would tend to facilitate this kind of vertical cloud cell development and thus intensify the risk of flight in cloud and associated icing.

At 14,000 feet the Islander has a climb capability of no more than 300 feet per minute given its gross weight of approximately 5,700 pounds. Had the pilot flown in the vicinity of high vertical cloud development or encountered downdrafts associated with mountain wave activity, the aircraft could have been forced into cloud and associated icing. Given the forecast of moderate to severe icing in cloud, the Islander, which was not equipped with anti-ice systems, could have suffered degraded performance because of icing to the extent that it was not possible to maintain level flight. Such an uncommanded descent into cloud would eliminate forward visibility and prevent navigation around the high terrain. Further, even short periods in cloud could cause the windscreen to become ice covered thus restricting visibility after the aircraft re-emerged from cloud.

The strong southerly winds that prevailed on the day of the occurrence would have likely produced some mountain wave activity or at least strong downdrafts in the lee of Mount Waddington, particularly, close to the summit. Vertical currents could exceed the climb performance of the Islander, forcing it down into the high terrain. The location of the last radar target, approximately one-half mile north and on the lee side of Mount Waddington, places the aircraft in an area where it would likely be subjected to moderate or severe downdrafts which would force the aircraft to descend.

Between the point of departure and Mount Waddington, the pilot could have expected, based on the Environment Canada Surface Analysis Weather Map, an altimeter setting difference of 0.05, equivalent to a 50-foot error if the altimeter was not reset. In terms of terrain clearance, this error is marginally favourable but insignificant when other factors (outside air temperature, mountain wave activity) that cause altimeter error are taken into account.

Due to colder than standard air temperature and possible mountain wave activity, a significant altimeter error existed that would cause the altimeter to indicate high and would result in less terrain clearance than expected. Based on the Vancouver and Port Hardy Winds Aloft Forecasts and using the standard temperature lapse rate of 1.98 degrees Celsius per 1,000 feet, outside air temperatures for these stations at 14,000 asl were estimated at minus 21 and minus 26 degrees Celsius respectively. Based on the pilot report (PIREP) provided to the pilot and using the same lapse rate, an OAT at 14,000 feet asl for the Islander was estimated at minus 17 degrees Celsius. Based on these observations, a conservative estimate of minus 19 degrees Celsius is used to reflect the actual OAT at 14,000 in the vicinity of Mount Waddington.

Given a reported en route altitude of 14,000 feet and an estimated pressure altitude of 14,340 feet, the calculated true altitude of the Islander would be approximately 13,650 feet asl. Including the favourable altimeter error (50 feet) due to the marginal pressure increase en route and without considering the mountain wave effect, the aircraft could have been as high as 13,700 feet asl. The elevation of Mount Waddington is 13,104 feet asl. Using the calculated 13,700 feet asl true altitude of the aircraft, a 596-foot vertical clearance could theoretically have been realized given no other adverse weather phenomena. The altimeter errors associated with mountain wave activity are, however, significant enough to have reduced the aircraft's true altitude to less than the summit elevation of Mount Waddington. Thus, given an appropriate heading, the Islander could have been low enough in level flight to strike the mountain.

It was established during the search that an approximate altitude of 12,500 feet is required for reliable reception of a transponder signal along the latter portion of the radar-plotted track. Thus with the pilot's initial call that he was at 12,500 feet 16 minutes after take-off, his call informing the King Air crew that he was climbing to 14,000 feet, and the continuing radar returns indicating that he was at or above 12,500 feet, it can be deduced that he was above 10,000 feet for about 50 minutes and, for the greater part of that time, above 12,500 feet.

The aircraft was not equipped with oxygen and at those altitudes the pilot could have experienced some degree of hypoxia. Normally at a cabin pressure altitude above 13,000 feet asl, the pilot should be continuously wearing a mask and using oxygen so there is no impairment of human performance.

It is known that both voice communication radios on board the aircraft were functioning. Had the pilot encountered a service difficulty, he was capable of transmitting a message to the operator's base – always, excepting sudden incapacitation of the pilot or disastrous failure of the aircraft. Since no call was received and the aircraft track was in the appropriate direction over an extended period, it can be concluded that the pilot most likely had control of the aircraft and that he was not experiencing any serious or immediate difficulty.

In view of the factors discussed above, there is a possibility that the Islander struck Mount Waddington. However, until the aircraft is located, it is impossible to determine what part, if any, these factors played in the circumstances of the aircraft's disappearance.

CONCLUSIONS:

Findings:
1. The pilot did not follow the VFR flight planned route.

2. The pilot was licensed and qualified to conduct the planned VFR flight. However, his instrument rating had expired four days before the occurrence.

3. The aircraft transponder target disappeared close to a high mountain where significant downdrafts were likely developing and which could exceed the aircraft's climb capability.

4. A significant altimeter error may have existed to cause the altimeter to indicate incorrectly high.

5. Oxygen, as required, was not available to the pilot during flight above 13,000 feet asl.

6. The aircraft's weight and centre of gravity were within the prescribed limits.

7. The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

Causes:
Until the aircraft is recovered, it is not possible to establish the cause of this accident.

SAFETY ACTION:

The Board has no recommendations to issue at this time.

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JACKSON AIR SERVICES LTD.
DHC-3 OTTER C-GIIQ
CHANNING (FLIN FLON), MANITOBA
16 DECEMBER 1987

BRIEF NUMBER: 87-C74113 (Incident)
LOCAL TIME: 1435 CST
OPERATION: Charter
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,500	75
LAST 90 DAYS	110	13

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

After loading the aircraft and boarding his two passengers, the pilot started the engine and began to taxi to the ice strip which was about 100 feet from the parking area. The aircraft had moved about 50 feet when the right ski broke through the ice, and the right wing tip contacted the ice. After the engine was stopped, the left ski broke through the ice, and the aircraft came to rest on a submerged wooden dock.

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WAGLISLA AIR INC.
PIPER PA-31 350 NAVAJO C-FWAG
PORT HARDY AIRPORT, BRITISH COLUMBIA
18 DECEMBER 1987

REPORT NUMBER: 87-P74145 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1115 PST
OPERATION: Regular Specific Point
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,000	1,600
LAST 90 DAYS	150	150

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	5

SUMMARY REPORT:

During the approach to the airport, when the pilot selected the landing gear down, the main gear indicated unsafe. The pilot carried out a missed approach and selected the landing gear up. He then flew around for approximately an hour while attempting to lower the landing gear; unsuccessful in his attempt, the pilot finally landed the aircraft with the gear up on runway 16 at Port Hardy. There were no injuries to the pilot or passengers and only minor damage to the aircraft lower fuselage and propellers.

Examination of the landing gear showed that the nose gear was operating normally and that the main landing gear was unlocked but could not extend because the main landing gear doors would not open.

The hydraulic power pack was removed and bench tested, and no fault was found. The electrical circuit and the rigging of the landing gear were checked. The only abnormality found was that the nose gear up limit switch was not being contacted when the gear was in the up position; this, however, would not have caused the gear doors to stick. No contaminants were found in the hydraulic power pack when it was bench tested, nor when it was subsequently disassembled and overhauled. The nose gear operated normally because its doors are mechanically operated.

It could not be determined why the main landing gear doors would not open.

CONCLUSIONS:

Findings:

1. The pilot carried out a wheels-up landing when the main landing gear doors would not open.

2. The nose gear up limit switch was found to be out of position.

Causes:

The main landing gear doors failed to open.

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RISK OF COLLISION BETWEEN: CESSNA 402B C-FQTA and SHORT & HARLAND SD 360 C-GTAX VICTORIA INTERNATIONAL AIRPORT, BRITISH COLUMBIA 27 JANUARY 1988

REPORT NUMBER: 88-P0015
LOCAL TIME: 1915 PST
INFORMATION SOURCE: Field Investigation

CESSNA 402B C-FQTA

OPERATOR: Aztec Aviation Ltd.
OPERATION: Regular Specific Point
DAMAGE: None
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,025	25
LAST 90 DAYS	120	25

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

SHORT & HARLAND SD 360 C-GTAX

OPERATOR: Time Air Inc.
OPERATION: Regular Specific Point
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	5,500	1,200	3,200	900
LAST 90 DAYS	190	190	190	190

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	3
PASSENGERS	-	-	15

HISTORY OF THE FLIGHT:

After a flight from Vancouver, the Cessna 402 landed on runway 27 at Victoria Airport during the hours of darkness; the tower then cleared the pilot for a left turn onto taxiway Golf with instructions to contact ground control. When the pilot contacted ground control, he was asked to confirm his position on taxiway Golf, then he was cleared to taxi via taxiway Golf with a right turn onto runway 20, then to the terminal. Instead of proceeding straight down taxiway Golf in a southeasterly direction, the pilot continued the turn to an easterly heading, entering taxiway Echo and then runway 13/31. At this

point he called ground control to ask if he was on runway 02/20. He then did a 180-degree turn on the runway and proceeded to the terminal as cleared.

The Short 360 was taxiing to runway 31 for a flight to Vancouver. As he neared the runway, he was cleared for take-off by the tower controller, after ground control had received confirmation by the pilot of the Cessna 402 that he was established on taxiway Golf. As the Short 360 pilot entered the runway, he observed the lights of the Cessna 402 on the runway ahead. He stopped and advised the tower that there was an aircraft on the runway. When the Cessna 402 cleared the runway, the Short 360 departed.

PERTINENT INFORMATION:

Victoria Tower was undergoing a major renovation at the time of the occurrence. Since the construction period was in excess of a year, a temporary tower was located on the north side of the runway complex. This tower gave the controller a view of the airport from about 20 feet above ground level (agl) as opposed to 58 feet agl from the permanent tower.

The pilot of the Cessna 402 had flown into the Victoria Airport at night before but had not taxied to the terminal via this route in darkness. Taxiway Golf parallels the west side of runway 13/31, and taxiway Echo parallels the south side of runway 09/27. The area where the taxiways intersect is widened to accommodate turns.

It was dark at the time of the occurrence, but there was no restriction to visibility.

The trainee controller was working the airport control position under supervision of a qualified controller.

ANALYSIS:

The temporary tower is close to the scene of the occurrence, but due to the level at which the controllers are situated, their viewing angle of the airfield is shallow compared to the view from the permanent tower. As a result, the area in question appeared as a sea of blue and white lights, and the controller was unable to judge the exact position of the aircraft. To overcome this problem, if a controller was uncertain of an aircraft's position, he would ask the pilot to confirm his position verbally. In this case, the ground controller asked the pilot of the Cessna 402 to confirm that he was on taxiway Golf, and he received an affirmative reply. As the airport controller believed that runway 31 was free of other traffic, he cleared the Short 360 for take-off.

The pilot of the Cessna 402 was unfamiliar with this route to the terminal and, in the confusion of blue lights at the intersection of taxiways Golf and Echo, continued to turn left, which led him to briefly intrude onto runway 13/31. A more serious situation was avoided by the crew of the Short 360 observing the Cessna 402 and delaying their take-off.

CONCLUSIONS:

Findings:

1. The lower temporary tower gives the controllers a reduced viewing angle of the airfield.

2. The pilot of the Cessna 402 was not familiar with the route to the terminal and inadvertently taxied onto runway 13/31.

3. The crew of the Short 402 observed the Cessna 402 on the runway and delayed the take-off.

Causes:

The pilot of the Cessna 402 inadvertently re-entered the active runway while taxiing.

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SUNWEST CHARTERS LTD.
FAIRCHILD SA-226TC METRO C-FSWC
FORT NORMAN, NORTHWEST TERRITORIES
10 mi S
04 FEBRUARY 1988

REPORT NUMBER: 88-W0022 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1235 MST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	6,800	260	3,156	220
LAST 90 DAYS	210	93	200	70

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	9

SUMMARY REPORT:

The aircraft departed Fort Simpson, Northwest Territories on a 55-minute flight to a 3,200-foot-long ice strip, about 10 nautical miles south of Fort Norman, Northwest Territories. Reverse thrust was applied after landing, and, as the aircraft decelerated through 75 knots, the nose yawed to the right, and the aircraft started to skid. The pilot attempted to correct with asymmetric power and nosewheel steering, but the aircraft continued to track to the right until it struck a snowbank about 1,500 feet down the right edge of the strip, where it came to a stop.

The crew believed that the brake on the right-hand main wheel had frozen. There were no other problems reported. The outside air temperature was –31 degrees Celsius, and braking action on the ice surface was reported to be good. The wind was calm.

The pilot was qualified on type and familiar with the strip. The landing was reported to be at the correct speed, with the aircraft tracking down the centre of the strip when the veer to the right developed. A post-crash inspection confirmed that the right brake had frozen up, causing it to bind.

CONCLUSIONS:

Findings:
1. The right brake had frozen up, causing it to bind.

2. The pilot lost control of the aircraft, and it swerved into a snowbank.

Causes:
The right brake froze up, causing it to bind.

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JACKSON AIR SERVICES LIMITED
CESSNA A185F SKYWAGON C-GISX
PONTON LAKE, MANITOBA
17 FEBRUARY 1988

BRIEF NUMBER: 88-C0032 (Accident)
LOCAL TIME: 1330 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	971	550
LAST 90 DAYS	230	190

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The aircraft lifted off from the snow-covered ice strip then settled back down on the snow. The pilot rejected the take-off as it was evident that the aircraft would not clear trees located on a point of land off the end of the strip. The pilot turned to the right to avoid the point, and side loads caused the left gear leg to collapse.

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DAWN AIR LTD.
DE HAVILLAND DHC-2 BEAVER C-FFHQ
POINTS NORTH, SASKATCHEWAN
22 FEBRUARY 1988

BRIEF NUMBER: 88-C0045 (Accident)
LOCAL TIME: 1244 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,415	525
LAST 90 DAYS	250	25

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

Shortly after lift-off from a narrow lake in strong, gusty cross-winds, the aircraft descended, and the skis struck a snow drift on a winter road that crossed the end of the ice strip. The impact resulted in a nose-up attitude which

caused the tail wheel/ski to strike the drift. The flight was continued, and, after landing at destination, an examination of the aircraft revealed substantial damage to the aft tailcone bulkhead.

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ACADEMY OF FLIGHT LIMITED
CESSNA 152 C-GQDZ
NORTH BAY AIRPORT, ONTARIO
25 JULY 1987

REPORT NUMBER: 87-O/70056 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1704 EDT
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	18	18
LAST 90 DAYS	18	18

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The student pilot was doing circuits on runway 26 at North Bay Airport. During the third touch-and-go landing, the aircraft landed hard on the left main gear and the nosewheel; the aircraft then bounced into the air, fell to the ground, and started to porpoise. After the third bounce, the nose gear collapsed, and the aircraft slid a short distance down the runway on its nose before coming to stop near the right side of the runway center line, 1,700 feet from the threshold.

The asphalt runway is 10,000 feet long and 200 feet wide and equipped with a visual approach slope indicator system (VASIS). The weather was ideal for visual flight rules (VFR) flight, and the wind was 280 degrees at 10 knots. The aircraft was serviceable, with sufficient fuel, and the centre of gravity and weight were within the prescribed limits.

The student pilot had performed six dual circuits with the instructor that day without incident, prior to the accident. On the approach, the pilot reported that the aircraft was high on the VASIS slope, and, in an attempt to maintain a selected flare point near the 1,000-foot markers on the runway, she brought the power to idle. An approach speed of 60 knots with 20 degrees of flap was maintained throughout the descent until the flare. During the flare, the left wing was low when the aircraft struck the ground. During the second bounce, the student released the control column and then pushed it forward in an attempt to pitch the nose down toward the runway.

The student rounded out for the landing at too high an altitude; she did not apply power to recover, and the aircraft then dropped hard onto the runway. The student was unable to regain control of the aircraft, and the resulting bounces caused the gear to collapse in overload.

FINDINGS:

Cause Related:
1. The student pilot misjudged the aircraft's altitude above the runway prior to starting the landing flare; as a result the aircraft landed hard and control was lost.

2. The aircraft's nose gear collapsed in overload.

Other:
-Nil-

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CESSNA 152 C-GVNM
SAINT-AGAPIT, QUÉBEC
08 AUGUST 1987

REPORT NUMBER: 87-Q74090 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1802 EDT
OPERATION: Specialty Flying Training
DAMAGE: None
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	735	600
LAST 90 DAYS	270	240

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot, with a student on board, was on a visual flight rules (VFR) flight between Québec City and Victoriaville, Québec, when the engine (Avco Lycoming O-235-L2C) lost partial power and started to vibrate violently. The pilot shut down the engine and force-landed the aircraft in a field without further incident.

The weather was not considered a factor in this incident. The aircraft was used mainly for pilot training. The engine had been modified in August 1982, in accordance

with Transport Canada Supplemental Type Approval (STA) Number P82/015, to allow the use of 80/87 grade fuel. The operator normally operated the aircraft on 100/130 as well as 100LL (low lead) grade fuel. An on-site inspection of the engine determined that the number three cylinder exhaust valve head was damaged. The piston had fractured in several places, and the engine case was cracked. Laboratory analysis determined that the damage to the exhaust valve occurred when the piston came into contact with it while the valve was stuck in the open position. It was not possible to determine why the valve had become struck in the open position. Traces of contaminants were found in the cylinder. Contamination in the cylinders is usually caused by frequent application of maximum power, improper management of the fuel mixture, and use of a fuel not recommended by the manufacturer. The 11 service instructions, letters, and bulletins listed below were issued by the manufacturer beginning in 1969; they all related to valve problems.

This list indicated that a problem with valves has existed since 1969 and that it has not been solved. The manufacturer's instructions, letters, and bulletins have not succeeded in eliminating the problem. Although it was not possible to determine why the exhaust valve became stuck in the open position, the accident aircraft was operated in a manner conducive to the formation of contaminants in the cylinder. When an aircraft is used for training, student pilots perform a large number of touch-and-go landings, and it is not always possible to lean the fuel mixture to reduce the accumulation of contaminants in the cylinder, as recommended by the manufacturer. The use of fuel not recommended by the manufacturer and frequent application of maximum power are also factors conducive to the formation of contaminants, resulting in valve sticking.

CONCLUSIONS:

Findings:

1. The operator was using fuel with an octane rating higher than that recommended by the manufacturer.

2. The aircraft was used mainly for pilot training.

3. In this type of operation, it was not always possible to follow the manufacturer's numerous recommendations, and the number three cylinder exhaust valve became stuck in the open position.

4. As a result of a partial power loss followed by severe vibrations, the pilot was forced to shut down the engine during flight.

Causes:

Damage to the valve and piston caused a partial power loss and severe vibration and resulted in the engine being shut down.

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INTERLAKE AVIATION CO. LTD.
CESSNA 152 C-GVTA
GIMLI, MANITOBA
21 AUGUST 1987

REPORT NUMBER: 87-C70065 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2015 CDT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:

	PILOT-IN-COMMAND		STUDENT PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	370	310	21	5
LAST 90 DAYS	20	20	20	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

The student pilot was taking instruction on precautionary landings. A field was selected, and the student entered the precautionary pattern. The final approach was steep and long, and the instructor took control to overshoot. He advanced the throttle rapidly from the idle position, but the engine did not respond. The instructor landed the aircraft in the field. The aircraft nosed over when the nosewheel touched down.

The engine, engine controls, and fuel system were inspected after the accident, and no faults were found. The fuel was checked and found free of contamination. All cockpit checks had been carried out prior to the approach, including the application of carburettor heat.

The field was checked by the instructor at high and low altitudes and appeared to be suitable. It was covered with swaths of mown hay, and a heavy rain shower had recently passed over the area.

When the throttle in the Cessna 152 is moved rapidly from idle to full power, there is a rapid increase in airflow into the carburettor. This introduces a time lag be-

fore the fuel metering system can compensate and provide the correct air/fuel mixture to the engine.

The student misjudged the approach, and the instructor took control and applied power to salvage the situation. However, a rapid movement of the throttle produced a time lag in providing the correct fuel/air ratio, and the engine did not respond. As the aircraft was near the point of stall, the instructor landed the aircraft in the hay field. When the aircraft touched down, the nosewheel contacted a row of wet hay, causing the aircraft to nose over.

CONCLUSIONS:

Findings:
1. The student misjudged the final approach, and the instructor's decision to overshoot was taken too late.

2. During the overshoot, the throttle was advanced too rapidly to obtain optimum engine response, and the instructor had to force-land the aircraft into a hay field.

3. The aircraft nosed over when the nosewheel struck a row of wet hay.

Causes:
The instructor allowed student error to progress too far before taking corrective action. He then advanced the throttle too quickly.

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NAMAO FLYING CLUB
STINSON 108 C-FLIK
LOUSANA, ALBERTA
23 AUGUST 1987

BRIEF NUMBER: 87-W70056 (Accident)
LOCAL TIME: 1345 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	146	12
LAST 90 DAYS	7	7

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was practise flying at a narrow grass airstrip. During the landing roll, the pilot had difficulty maintaining directional control and elected to go around. As he applied power, the aircraft veered sharply to the left and ran off the runway. The right main landing gear leg collapsed, resulting in substantial damage to the aircraft. The wind was light but gusty at 90 degrees from the right.

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INTERLAKE AVIATION COMPANY
PIPER PA-34-200 SENECA C-GYKL
WEYBURN AIRPORT, SASKATCHEWAN
28 AUGUST 1987

REPORT NUMBER: 87-C70071 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2030 CST
OPERATION: Flying Club Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	280	18
LAST 90 DAYS	110	18

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot, with one passenger on board, was conducting a visual flight rules (VFR) flight from Gimli, Manitoba to Weyburn, Saskatchewan. On the approach to land at Weyburn, the pilot selected the landing gear down and verified that the gear indication system showed three green lights. Immediately following a normal touchdown, the nose gear collapsed.

This was the third time the nose gear had collapsed in less than 300 flying hours. The first accident (CASB Report No. 87-C70012) occurred following a loss of electrical power, and the aircraft was landed with the nose gear partially extended. The second accident (CASB Report No. 87-C70094) occurred 65 flying hours after the aircraft was returned to service from the first accident. Undetected damage to the nose gear, as a result of the first accident, prevented the downlock link from keeping the drag brace fully extended and resulted in the collapse of the nose gear. Further investigation revealed that the actuator mounting bracket was damaged. An aluminum bracket was manufactured and installed by the

operator, who was unaware that the manufacturer had upgraded the specifications of the material from aluminum to steel. The drag brace was reinstalled, the landing gear was rerigged, and the aircraft subsequently flew 206 hours before the third accident.

Following the third accident, it was determined that the aircraft was equipped with an improperly manufactured drag brace. A dimensional check of the drag brace showed it to be out of overcentre limits. Piper Service Bulletin 413, issued by the manufacturer in 1974, stated that, if the specified limits were exceeded, the manufacturer was to be notified immediately and the aircraft was not to be returned to service.

Research of the aircraft technical log books showed that Piper Service Bulletin 413 had been signed out as complied with on 21 March 1983. There was no record of the drag brace having been replaced on this aircraft prior to, or since, the issuance of the Service Bulletin. Reinspection as per Piper Service Bulletin 413 is required by the manufacturer at every 100-hour maintenance inspection.

A properly manufactured drag brace, with the nose landing gear correctly rigged, produces an overcentre condition which prevents the nosewheel from collapsing. With the defective drag brace still in place and not properly overcentre, landing loads, which should have been absorbed by the drag brace, were transmitted through to the downlock link, the link assembly, and the actuator mounting bracket; the compressional loading was sufficient to cause deformation of these parts which altered the adjustment of the nose gear rigging. Loss of this critical downlock link adjustment allowed the drag brace to move up on landing, causing the nose gear to collapse.

CONCLUSIONS:

Findings:

1. The nosewheel collapsed because of loss of rigging tolerances and an out-of-limits nose landing gear drag brace assembly.

2. Landing loads were not absorbed by the drag brace but were transferred through the downlock link, the link assembly, and the actuator mounting bracket. Deformation of these parts resulted in a loss of nose gear rigging tolerances.

3. The loss of nose gear rigging tolerances in conjunction with drag brace movement resulted in the collapse of the nosewheel landing gear assembly.

4. The drag brace assembly was not within the permissible overcentre limits as specified by the manufacturer in Piper Service Bulletin 413.

5. Technical records indicated that the requirements of Piper Service Bulletin had been complied with.

6. There was no record that the drag brace had been changed since initial installation.

7. The nose gear actuator mounting bracket was manufactured using aluminum rather than steel as specified by the manufacturer.

Causes:

The aircraft was equipped with an improperly manufactured drag brace assembly.

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CESSNA 172N C-GGEY
ST-ANDRÉ-AVELLIN AIRPORT, QUÉBEC
29 AUGUST 1987

BRIEF NUMBER: 87-Q70039 (Accident)
LOCAL TIME: 1530 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	55	15
LAST 90 DAYS	6	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The aircraft, returning from a pleasure flight, was on final approach to the St-André-Avellin, Québec Airport. According to the pilot, there was no wind. On short final with full flaps selected, the vertical speed indicator showed a high rate of descent and the aircraft was nose-up. The pilot then decided to go around. He immediately retracted the flaps to 20 degrees, which resulted in a loss of lift, and the aircraft touched down heavily. During the ground run, the pilot was unable to control the aircraft, and it came to a stop off the left side of the runway. The pilot and the passengers escaped uninjured, and the aircraft was substantially damaged.

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ATLANTIC AIRWAYS LIMITED
PIPER PA-28-140 C-GQDA
ST. JOHN'S, NEWFOUNDLAND
01 SEPTEMBER 1987

BRIEF NUMBER: 87-A70030 (Accident)
LOCAL TIME: 1320 NDT
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	29	29
LAST 90 DAYS	4	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The student was practising circuits and landings in calm wind conditions. During the second landing, he experienced control problems which resulted in a hard landing. Two more landings were completed before the flight was terminated.

Post-flight inspection of the aircraft revealed that the propeller was bent and that the engine and nose gear mount assembly was cracked and bent.

The student did not know that the propeller had struck the ground. He had been cautioned about wake turbulence from a departing aircraft but was not sure if the turbulence had anything to do with the hard landing.

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WETASKIWIN AIR SERVICES
CESSNA 172 M SKYHAWK C-GYFR
WETASKIWIN AIRPORT, ALBERTA
10 SEPTEMBER 1987

REPORT NUMBER: 87-W70061 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1755 MDT
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	108	14
LAST 90 DAYS	10	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot, who was undergoing training for a commercial licence, was practising a short-field landing while flying solo. On touchdown, the aircraft bounced and ballooned to an estimated 15 feet above the runway, landed heavily, and bounced again. On the next touchdown, the nosewheel strut and tire were compressed sufficiently for the propeller to strike the runway; the aircraft then veered to the left and came to a stop clear of the runway.

Weather conditions at that time were good, with clear skies, a light wind, and good visibility. The aircraft was serviceable, and no mechanical deficiencies contributed to the occurrence. With the flaps selected down and power off, the stalling speed of the aircraft is 49 mph. The recommended approach speed for a short-field landing, with power off and 40 degrees of flap selected, is 70 mph; the pilot reported that he had approached and touched down at 80 mph.

Since obtaining his private licence one year earlier, the pilot had frequently made recreational flights but had never used flaps for landing, and, during his commercial training, all but one of his landings had been flapless. He had no recent training or practice in short-field landing or in recovering from a bounced landing. On this flight, his first solo flight since starting his commercial training, he was attempting a short-field landing with 30 degrees of flap extended.

The difference in attitude between a flapless and a 30-degree flap landing caused the pilot to misjudge the flare and to overcontrol on touchdown. The relatively high approach speed accentuated the bounce, and the recommended recovery technique was not employed. On the last landing, the aircraft landed on the nosewheel

with sufficient force for the propeller to strike the runway.

CONCLUSIONS:

Findings:
1. The pilot was not proficient in landing with flaps selected.

2. The approach speed was higher than that recommended for short-field landing.

3. The pilot did not round out correctly for the landing.

4. The aircraft bounced twice before landing.

5. The pilot did not employ the correct technique for recovery from a bounced landing.

6. The aircraft landed on the nosewheel, and the propeller struck the ground.

Causes:
The pilot did not round out correctly for the landing with 30 degrees of flap extended and did not use the recommended technique to recover from the bounced landing.

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ROCKCLIFFE FLYING CLUB INC.
CESSNA 152 C-GBJU
OTTAWA-ROCKCLIFFE AIRPORT, ONTARIO
11 SEPTEMBER 1987

BRIEF NUMBER: 87-O/70069 (Accident)
LOCAL TIME: 1700 EDT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Student Pilot

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	26	26
LAST 90 DAYS	26	26

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The student pilot was practising a soft-field landing on runway 09. On final approach, the aircraft was too low, and the landing gear struck a wire fence. The aircraft landed on the runway; however, the nosewheel collapsed on touchdown.

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WILLIAM FERRING ENTERPRISES
DE HAVILLAND DHC-3 OTTER C-FNWX
MCKENZIE LAKE, ONTARIO
10 OCTOBER 1987

REPORT NUMBER: 87-C70082 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1003 EDT
OPERATION: Commercial Non-Revenue
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	12,500	500	5,000	10
LAST 90 DAYS	250	25	100	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	1

SUMMARY REPORT:

The purpose of the flight was for the captain to check out the co-pilot on the float-equipped aircraft; with the co-pilot at the controls, the aircraft took off for a visual flight rules (VFR) flight to nearby South Smoothrock Lake, Ontario. The take-off run and lift-off appeared normal; the pilot selected climb flap, reduced engine power to that recommended for climb, and turned to fly along a valley leading away from the lake. The aircraft was at an altitude of 75 to 100 feet above ground level (agl) and approaching trees near the edge of the lake when it began to lose altitude. The captain applied power, but this did not arrest the descent, and the aircraft struck trees and crashed one quarter of a mile from the shoreline.

The aircraft, with two pilots, one passenger, and a cargo of sawdust on board, was near the maximum take-off weight. The centre of gravity was calculated to be within limits.

When the captain prepared for the flight, he refuelled the aircraft, pumped out the floats, and ran the engine for several minutes. He noted that the windscreen had a little hoar frost which disappeared while the engine was

running; however, he did not check the upper wing surfaces for hoar-frost accumulation.

The temperature at the time of the occurrence was minus one degree Celsius, the wind was from the west at 12 gusting to 20 knots, and high cloud covered the area. Other pilots in the area reported that downdrafts were common when the wind was from the west.

After take-off, the co-pilot who was at the controls selected climb flap and reduced power to 30 inches of manifold pressure (MP) and 2000 rpm from 35 inches of MP and 2200 rpm. Carburettor heat was set to maintain four degrees Celsius. When the aircraft began to lose altitude, the captain lowered the nose of the aircraft in an attempt to gain airspeed and then full power was applied in an attempt to arrest the descent.

The flight manual recommends that, after take-off, the engine manifold pressure and propeller rpm be reduced by two inches and 50 rpm respectively until the aircraft has reached an altitude of about 500 feet agl, at which time the reduction to climb power can be made safely.

A deviation from the power settings recommended by the aircraft manufacturer and an accumulation of hoar frost on the wing surfaces resulted in a degradation of the aircraft's performance, and the aircraft could not maintin altitude. This situation was probably compounded by downdrafts that occur in the area when the wind is from the west.

CONCLUSIONS:

Findings:

1. The crew did not adhere to the manufacturer's recommended power settings and flap retraction after take-off.

2. The aircraft took off with hoar frost on the upper surfaces of the wings.

3. Pilot reports indicated that downdrafts are common in this area when the wind is from the west.

4. The aircraft could not maintain altitude and struck trees shortly after take-off.

Causes:

The crew did not adhere to recommended take-off procedures.

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CESSNA 152 C-GZKE
BELOEIL, QUÉBEC 10 mi NE
12 NOVEMBER 1987

REPORT NUMBER: 87-Q70052 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0945 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	174	68
LAST 90 DAYS	21	21

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The private pilot, with one passenger aboard, was practising a forced approach toward an open field. Just as the pilot was about to apply power for the overshoot, the aircraft struck two wires. The aircraft climbed away and was landed safely at St. Hubert. Both blades of the propeller, the top of the fin, and the rudder were damaged; neither of the occupants was injured.

The occurrence took place at 0945 eastern standard time (EST), as the sun was just above the horizon. The weather was clear with 15 miles visibility, and the winds were calm. The pilot made his descent toward the open field, with the sun at his one o'clock position. The pilot stated that he was about to apply power for the overshoot when he spotted one or possibly two wires directly in front of his aircraft, but he was unable to avoid striking them.

The evidence of the dent marks on the propeller blades indicated that the two wires were about one quarter of an inch in diameter. The exact location of the occurrence site was not determined, nor were there any reports of hydro or telephone line breakages of any kind.

In the Transport Canada brochure entitled "Instructor Study Guide", it is recommended that pilots do not descend below 500 feet above ground level (agl) during a practice forced landing. The pilot should have been aware of this recommended minimum altitude.

The pilot continued his forced approach to an altitude below the recommended 500-foot agl limit. While the pilot was descending for his practice forced approach, the wires would have been concealed by the background. When he levelled off for the overshoot, he was looking toward the sun, which would have reduced his

ability to see, and he did not spot the wires in time to avoid them.

CONCLUSIONS:

Findings:
1. The pilot descended below 500 feet agl during a practice forced approach, contrary to recommended practice.

2. The pilot did not see the wires in time to avoid striking them.

Causes:
The pilot continued his practice forced approach to below the recommended minimum altitude and was unable to see the obstructing wires until it was too late to avoid them.

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TRINITY WESTERN UNIVERSITY
CESSNA 180 SKYWAGON C-FPYZ
LANGLEY AIRPORT, BRITISH COLUMBIA
12 NOVEMBER 1987

REPORT NUMBER: 87-P70098 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1659 PST
OPERATION: Specialty training
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	240	12
LAST 90 DAYS	38	12

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot, returning from a local flight shortly before official nightfall, had been cleared to right base for runway 01. A short time later, he requested a straight-in landing on runway 25, an unlighted turf runway. The tower controller informed the pilot that the wind was from 060 degrees magnetic at five knots, a tail wind, and cleared him to land on runway 25. Following a normal approach, the aircraft landed hard and bounced. On the second touchdown, the aircraft veered sharply to the right, and the right wing tip contacted the runway. During this sequence, the right gear leg was broken off, and the aircraft was substantially damaged.

The pilot was licensed and qualified on the aircraft type. His licence was also endorsed for night flight.

The gear leg failed at the upper bolt holes at the wheel axle attachment end. It was forwarded to the Canadian Aviation Safety Board Engineering Laboratory for analysis. One of the upper bolt holes was found to have multiple fatigue pre-cracks at two diametrically opposed locations on the bore hole. A minute fatigue crack can act as a severe notch and cause instantaneous overload failure of the leg under normal operating conditions. The laboratory analysis concluded that the leg failed because of multiple fatigue pre-cracks which had reached a critical size.

The time of the accident was shortly before official nightfall, and the sky was overcast, reducing the light conditions; also, it was raining lightly, although the visibility was reported to be 10 miles.

The conditions of severely reduced light, the unlighted runway, and rain on the windshield reduced the pilot's ability to judge the landing flare and led to the hard landing and bounce. The relatively heavy load that this imposed on the landing gear was sufficient to break the gear leg, which was already weakened by multiple fatigue pre-cracks.

CONCLUSIONS:

Findings:
1. Runway 25 was unlighted.

2. Darkness and rain on the windscreen reduced the pilot's ability to judge his height above the runway.

3. The pilot made a hard landing.

4. The right gear leg had multiple fatigue pre-cracks that had reached a critical size.

5. The right gear leg failed from overload as a result of the hard landing.

Causes:
The right gear leg, weakened by fatigue cracks, failed in overload caused by a hard landing.

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CESSNA 172N SKYHAWK C-GXUV
OLDS-DIDSBURY, ALBERTA
15 NOVEMBER 1987

BRIEF NUMBER: 87-W70074 (Accident)
LOCAL TIME: 1020 MST
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Student Pilot

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,100	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The student pilot was practising touch-and-go landings. On approach, he judged that the aircraft was too high. He side- slipped to lose altitude but failed to straighten the aircraft prior to touchdown. The aircraft landed off runway heading, and the pilot lost directional control. The aircraft ran off the runway and into a ditch.

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AERO AVIATION CENTER (1981) LTD.
PIPER PA-30 TWIN COMMANCHE C-FBDK
VILLENEUVE AIRPORT, ALBERTA
13 DECEMBER 1987

BRIEF NUMBER: 87-W70085 (Accident)
LOCAL TIME: 1450 MST
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:

	PILOT-IN-COMMAND		STUDENT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	2,300	300	1,450	4
LAST 90 DAYS	115	35	7	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The student pilot was under instruction for a multi-engine endorsement. The aircraft was flown from the Edmonton Municipal Airport to the Villeneuve Airport to conduct practice circuits. The instructor requested a short-field obstacle approach with a touch-and-go landing. After a successful landing, the student began to clean up the aircraft for take-off, and inadvertently selected the landing gear up instead of the flaps up. The landing gear retracted, and the aircraft skidded for 620 feet before coming to rest on the runway. Both occupants evacuated the aircraft without injury. The aircraft propellers were bent, and the lower fuselage was extensively damaged.

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PROFESSIONAL FLIGHT TRAINING (GOLDEN EAGLE FLYING ACADEMY)
CESSNA 150B C-FOJV
WINNIPEG/ST. ANDREWS, MANITOBA
15 DECEMBER 1987

REPORT NUMBER: 87-C70092 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1335 CST
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	8,000	2,000
LAST 90 DAYS	150	150

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

The student and instructor had taken off in the aircraft and were in the climb-out at about 150 feet above the ground when the engine hesitated slightly. The instructor applied carburettor heat, but, as the aircraft flew over the end of the runway, the engine lost all power. The instructor took control and carried out a forced landing on a cultivated field.

The aircraft was equipped with a fuel system drain between the fuel selector and the fuel filter bowl. The drain line was connected with a tee fitting to the main fuel supply line and extended to the belly of the aircraft where it passed through the skin to the outside. It was equipped with a plug fitting and part of the 100-hour maintenance inspection process was to drain it; this required the use of two wrenches.

It was found that the belly drain line had filled with water, probably as a result of condensation accumulated

over a period of time. The water had frozen and expanded, causing a complete blockage of the main fuel line. When the aircraft was warmed to a temperature above freezing after the accident, the ice in the belly drain line melted, and fuel was able to flow to the engine. The volume of water taken from the belly drain was equivalent to the volume of the drain tubing.

The student and instructor were not aware that there was a belly drain, and, in any case, two wrenches were required to open the drain. A quick-drain fitting can be installed, as an option, thus permitting a drain check by hand during the pre-flight inspection.

Water in the belly drain line, probably as a result of condensation, froze and expanded, blocking the main fuel line. This resulted in the engine losing all power due to fuel starvation.

CONCLUSIONS:

Findings:

1. Water in the belly drain line froze and expanded, blocking the main fuel supply line.

2. The blocked fuel line resulted in the engine losing all power because of fuel starvation.

3. The belly drain line required the use of two wrenches to open it and was required to be drained only at 100-hour inspections.

4. An optional quick-drain fitting for the belly drain was not installed.

Causes:

The engine lost power because of a blocked main fuel line.

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ROCKCLIFFE FLYING CLUB (1961)
CESSNA 152 C-GNPM
ROCKCLIFFE AIRPORT, ONTARIO
29 DECEMBER 1987

BRIEF NUMBER: 87-O/70090 (Accident)
LOCAL TIME: 1115 EST
OPERATION: Flying Club Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	50	48
LAST 90 DAYS	4	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot attempted to take off from an ice-covered runway with a 90-degree cross-wind from the right at about eight knots. As the pilot applied full power and commenced the take-off roll, the aircraft began to drift to the left side of the runway. When the pilot realized he could not maintain directional control of the aircraft, he rejected the take-off; however, the aircraft continued to drift to the left and struck a snowbank off the edge of the runway. The aircraft nosed down and came to a stop.

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PACIFIC FLYING CLUB
PIPER PA-34-200 SENECA C-GXFP
BOUNDARY BAY AIRPORT, BRITISH COLUMBIA
29 JANUARY 1988

REPORT NUMBER: 88-P0017 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1015 PDT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	8,000	250
LAST 90 DAYS	120	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

In preparation for a flight to practise instrument flight instruction, one instructor refuelled the twin-engined aircraft and taxied it back to the flying club in order to pick up another instructor, who was to perform safety pilot duties.

The instructor in the aircraft left both engines running and set the parking brake, and the other instructor, the safety pilot, climbed into the back of the cabin through the right front door. The instructor in the left front seat then moved to the right front seat to let the safety pilot climb into the left front seat from the rear. As the instructors were arranging their seating, the aircraft started to move forward in a gentle left turn until its left wing struck the right-hand wing strut of a parked Cessna 172. The Seneca then pivoted into the Cessna 172, causing substantial damage to both aircraft but no injury to the occupants. Neither of the instructors had noticed that the aircraft was moving until the impact.

The parking brake on this aircraft is a lever which extends below the instrument panel just to the left of the centre console between the two front seats. The parking brake is set by pulling back on the lever and pressing a locking button on the top of the lever; it is released by pulling back on the lever and releasing the locking button. The parking brake was checked after the accident and found to be serviceable. The right-hand pedals on this aircraft were not equipped with brakes.

It is possible that the parking brake was not set properly; it is also possible that the brake was released accidentally while the instructors were changing seats. The fact that the Seneca swerved into the parked Cessna 172 after striking the Cessna's wing strut indicates that the Seneca had gathered some speed; had the brake been partially set, the aircraft would probably have moved forward slowly; therefore, it is most likely that the parking brake lever was accidentally released when the instructors changed seats.

CONCLUSIONS:

Findings:
1. The aircraft moved forward, unnoticed by either instructor, and struck a parked aircraft.

Causes:
The parking brake was probably accidentally released when the instructors were changing seats.

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NADEAU AIR SERVICE INC.
CESSNA 150L C-GUBA
TROIS-RIVIÈRES AIRPORT, QUÉBEC
09 FEBRUARY 1988

REPORT NUMBER: 88-Q0026 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1610 EST
OPERATION: Specialty Training
DAMAGE: Substantial
PILOT LICENCE: Student Pilot Permit

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	25	15
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The student pilot was authorized to conduct a solo flight to practise circuits. During the initial climb, while the aircraft was at an altitude of approximately 700 feet above the ground (agl), the engine stopped. The pilot made an immediate 180-degree turn to the left and landed on the taxiway strip parallel to the runway. The aircraft hit a snowbank at the end of the taxiway and nosed over. The student pilot was not injured.

The aircraft was on its first flight of the day. It had been fully refuelled the previous day and parked outside all night. From engine start to take-off (25 minutes), the engine was kept running at a low rpm. Before take-off, the pilot did a run-up which included a carburettor heat check. The temperature of minus 12 degrees Celsius and dew point of minus 19 degrees Celsius were not conducive to carburettor icing, and carburettor heat was not used for the flight. When the engine suddenly stopped, the pilot lowered the nose of the aircraft, banked hard to the left toward the parallel taxiway, then applied full carburettor heat, and attempted to restart the engine, but without success.

The pilot did not extend the flaps for landing, and, as a result, the aircraft landed long and fast. The pilot could not stop the aircraft before it reached the end of the taxiway, and the aircraft nosed over after hitting the snowbank.

A check of the engine and its components did not reveal any problems, and the engine run-up was normal. Conditions were not conducive to carburettor icing. There was sufficient fuel, and the fuel system was not contaminated. The cause of the sudden engine failure could not be determined.

CONCLUSIONS:

Findings:
1. The engine stopped during the initial climb.

Causes:
The Canadian Aviation Safety Board could not determine why the engine stopped.

VIRDEN AVIATION LIMITED
CESSNA 150L C-FDDY
REDVERS, SASKATCHEWAN 1 mi NE
12 FEBRUARY 1988

BRIEF NUMBER: 88-C0030 (Accident)
LOCAL TIME: 1810 CST
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	985	650
LAST 90 DAYS	110	90

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

In approaching darkness, the pilot overflew the airstrip and carried out a tear drop turn to final approach. After turning to the final approach heading, the aircraft was lined up between the left runway markers and a wind fence instead of between the runway markers. Touchdown was west of the strip in grass stubble which was drifted over with snow. The nose gear struck a frozen mound during the landing roll and the nose gear assembly fractured. The aircraft came to rest in a nose down attitude.

INTERLAKE AVIATION LTD.
CESSNA 150M C-GZCW
GIMLI AIRPORT, MANITOBA
22 FEBRUARY 1988

REPORT NUMBER: 88-C0040 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2130 CST
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	68	68
LAST 90 DAYS	68	68

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was conducting a local night exercise and had completed a number of circuits and touch-and-go landings. While on final approach for another touch-and-go landing, the pilot noticed the aircraft was low and applied power. At this time, the runway lights went out, and the pilot advanced the throttle to overshoot. The engine hesitated momentarily, and the aircraft continued to descend, touching down short of the runway. After rolling for a short distance, the aircraft rotated on its nose and came to rest in an inverted position.

During the final approach, the pilot selected carburettor heat to the ON position. When he saw he was low, he advanced power to 1700 rpm, noting he was about three to four metres above the ground.

The airfield uses the Aircraft Radio Control of Aerodrome Lighting (ARCAL) system. The runway lights are switched on by a pilot activating his microphone switch five times within a period of five seconds; the lights remain on for approximately 15 minutes. The system was serviceable and in use before and after the occurrence. The pilot was activating the ARCAL system every second circuit in accordance with standard procedures. The occurrence circuit was the second since the ARCAL had been reactivated, and the circuit pattern flown was larger than normal.

The period of time taken to fly the last two circuits exceeded the ARCAL time cycle, and the runway lights went out when the aircraft was on final approach. The final approach was flown low, and, although the pilot initiated an overshoot, the aircraft continued to descend, landing short of the runway.

CONCLUSIONS:

Findings:
1. The pilot commenced an overshoot from a low final approach because the runway lights went out.

2. During the overshoot, the aircraft descended and contacted the ground short of the runway.

3. The runway lights extinguished because the ARCAL time cycle had lapsed.

Causes:
The pilot did not reactivate the aerodrome lighting system, and the lights went out during final approach.

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DE HAVILLAND DHC-2 BEAVER C-GMPE
POWELL LAKE, ONTARIO
25 JULY 1987

REPORT NUMBER: 87-C70057
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1100 EDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,800	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	1	-	-

HISTORY OF THE FLIGHT:

The float-equipped aircraft departed the water base at Shebandowan Lake on a visual flight rules (VFR) flight, stopping at Bemar and continuing on to Powell Lake. At about 1058 eastern daylight time (EDT), witnesses at Powell Lake heard, then saw the aircraft fly parallel to the lake over the camp, at approximately 200 feet above the trees. The aircraft was descending with flaps down when it banked left toward the lake and disappeared from view behind a ridge. Moments later, the witnesses heard a crashing noise, and the aircraft was found in an inverted position on the beach. Both occupants received fatal injuries.

PERTINENT INFORMATION:

The weather was suitable for the flight, with a slight wind from the west.

An examination of the aircraft weight and balance showed the weight to be within the prescribed limits, but the centre of gravity was slightly ahead of the forward limit. The manufacturer states that with the aircraft loaded in this way, there would be no longitudinal control problems.

The aircraft's left float hit a 100-foot-high tree, 50 feet from the lake shore. The tree, which was 15 feet taller than the surrounding trees, was struck eight feet from the top. The left wing tip hit another tree 29 feet further on. The aircraft was out of control and in a left turn when it crashed on the beach in a nose-down attitude, 200 feet from the initial impact with the tree.

The witnesses initially heard the engine power being reduced, and then it remained steady. After the accident, the engine was partially disassembled and was found to be capable of producing power. Forward bending of both propeller blade tips, along with abrasion marks running across the blade camber, indicated that the engine was driving the propeller at the time of impact.

A thorough examination of the wreckage provided no evidence to indicate that there had been a failure or malfunction of any part of the aircraft, and there was no evidence that the flight control system was unserviceable.

On days when the wind was from the west, the pilot used to fly around a ridge located north of the camp and then turn toward the lake and land parallel to the lake shore, heading toward the Powell Lake Camp dock; this minimized the taxi distance but necessitated a tight turn close to the trees during the approach.

ANALYSIS:

The flight path taken by the pilot during the approach put the aircraft too close to the trees, and the aircraft had insufficient altitude to clear any unexpected obstacles, in this case, the one taller tree. Had the pilot elected to land out into the lake his safety margin would have been substantially increased.

CONCLUSIONS:

Findings:
1. The flight path taken by the pilot during the approach put the aircraft too close to the trees.

2. The aircraft struck the trees and crashed on the beach in a nose-down vertical attitude.

Causes:
The pilot flew the aircraft too close to the shore and misjudged his altitude on approach.

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AIR SPRAY (1967) LTD.
DOUGLAS A26C INVADER C-GXGY
LAKE LABERGE, YUKON
26 JULY 1987

REPORT NUMBER: 87-W74073 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1800 YDT
OPERATION: Specialty Aerial Control
DAMAGE: Minor
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6,500	180
LAST 90 DAYS	50	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was flying at an altitude of about 50 to 75 feet above the water for a retardant drop on a fire burning on an island in Lake LaBerge, Yukon. The aircraft flew through the smoke, and, as it emerged, the left wing struck a pine tree. The flying characteristics of the aircraft were not affected, and the aircraft was flown back to Whitehorse without difficulty.

The pilot had been warned by radio of a tree-top that rose above the general height of the trees in the fire area. He noticed one tree-top off to his right as he approached the fire and assumed that it was the one about which he had been warned. The tree struck by the aircraft protruded about 15 feet above the surrounding trees.

The altitude at which the aircraft flew for the retardant drop allowed it to clear the trees on the island with the exception of one or two isolated protruding tree-tops. The pilot believed he had the protruding tree-top mentioned in the radio warning in sight. He did not see the other protruding tree-top ahead of the aircraft because it was obscured by smoke until just before impact. During the retardant run, the pilot did not fly at a sufficient altitude to ensure that the aircraft would clear all obstacles.

FINDINGS:

Cause Related:
1. The pilot did not see the protruding tree-top because it was obscured by smoke.

2. The pilot flew at an altitude that would just clear the trees because he believed he had located and would miss a protruding tree-top known to be on the island.

Other:
-Nil-

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KANATA AVIATION
GRUMMAN G-164B AGCAT C-GSWP
ST. ANDRE, NEW BRUNSWICK
27 JULY 1987

BRIEF NUMBER: 87-A70025 (Accident)
LOCAL TIME: 0600 ADT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,000	1,500
LAST 90 DAYS	60	60

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was taking off from a dirt road which was 20 to 25 feet wide and which had a 10-degree upslope for the initial part of the take-off roll. During the take-off, the aircraft veered off the road and nosed over in a ditch.

The pilot had previously made about 1,000 take-offs from the road. The dawn light conditions and the reduced forward visibility out of the tail-wheel-equipped aircraft on the upslope area of the take-off path affected the pilot's ability to keep the aircraft straight. The wind was very light.

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MITCHINSON FLYING SERVICE
CESSNA 172P SKYHAWK II C-GJMG
SUMMERBERRY, SASKATCHEWAN
27 JULY 1987

REPORT NUMBER: 87-C70060
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1740 CST
OPERATION: Aerial Photography
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	294	N/A
LAST 90 DAYS	55	48

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	1	-	-

HISTORY OF THE FLIGHT:

The pilot and photographer were conducting a flight in the rented aircraft to photograph farms in the area. The aircraft was seen flying low over several small towns with engine power being alternatively reduced, then increased. The aircraft made a number of low passes over the town of Summerberry, then turned quickly to the left. During the turn, the aircraft suddenly descended and struck the ground.

PERTINENT INFORMATION:

The aircraft struck the ground at a near vertical angle and at low speed. The wreckage was confined to a small area. The damage indicated that the engine was developing power at impact, and there was no evidence of any malfunction of the controls, the engine or any other system. The flaps were extended approximately 20 degrees, and the elevator trim was nose up. The weight and centre of gravity were within the prescribed limits.

The weather was excellent with high scattered clouds and light winds. The temperature was 30 degrees Celsius, resulting in a density altitude of over 4,000 feet. The pilot was new to this type of operation having been hired two weeks earlier. The crew was on their second flight of the day, and, at the time of the accident, had flown a total of 7.9 hours that day.

The normal procedure used by the pilot on photographic flights was to fly at 150 to 200 feet above the ground, at relatively low airspeed, utilizing 20 degrees of flap. As the aircraft approached the place to be photographed, the pilot would use crossed controls to yaw the aircraft so the photographer could aim his camera between the propeller arc and the right wing strut. Prior to the camera being operated, the pilot would reduce power to idle to minimize airframe vibrations. At the end of the photographic run, a turn to the next track would be made using 45 to 60 degrees of bank. The stalling speed of the aircraft with the flaps at 20 degrees was 51 knots at 45 degrees of bank and 61 knots at 60 degrees of bank.

ANALYSIS:

The descent angle and low speed on impact indicated that the aircraft had stalled during the left turn. The nose-up trim position was consistent with the configuration required for slow speed flight.

The large yaw angles and the high angles of bank used by the pilot while the photographs were being taken increased the stall speed. The margin of safety would have been further reduced by the high density altitude degrading aircraft performance.

Because the pilot had made a number of similar runs that day and had flown 7.9 hours in very hot temperatures, his judgement may have been affected.

It was determined that the pilot banked the aircraft steeply at low airspeed, causing the aircraft to stall at an altitude from which recovery was not possible.

CONCLUSIONS:

Findings:
1. The pilot banked the aircraft steeply at low airspeed.

2. The aircraft stalled at an altitude from which recovery was not possible.

Causes:
The pilot banked the aircraft steeply at low airspeed, and the aircraft stalled.

SPECTRA AVIATION LTD.
CESSNA 185A SKYWAGON CF-OHI
MISSISSAUGA LAKE, ONTARIO
07 AUGUST 1987

BRIEF NUMBER: 87-O/70060 (Accident)
LOCAL TIME: 1530 EDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	362	155
LAST 90 DAYS	140	140

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The flight was returning to Mississauga Lake from a passenger charter to Fair Lake. Upon landing, the pilot misjudged the aircraft to water touchdown height, and the left float dug into the water. The aircraft flipped over and came to rest upside down.

The pilot misjudged his height during the landing flare because of glare from the sun. The landing was made into 5- to 10-knot wind.

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SOUNDAIR CORPORATION
GENERAL DYNAMICS CORPORATION
CV-580 C-GKFP
MONCTON, NEW BRUNSWICK
17 AUGUST 1987

REPORT NUMBER: 87-A74084
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2105 ADT
OPERATION: Charter
DAMAGE: Nil
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	12,700	N/A	N/A	N/A
LAST 90 DAYS	N/A	N/A	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	3
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The aircraft was on a charter flight from Moncton, New Brunswick to Toronto, Ontario. During take-off, it was observed that the number two engine (Allison 501D13) was producing approximately 300 horsepower (hp) less than the number one engine, but the power was still within acceptable limits. Shortly after establishing climb power, it was noted that the number two engine reduction gear oil pressure was within normal operating limits at 240 pounds per square inch (psi), but was 20 to 30 psi higher than on previous flights. The captain visually inspected the number two engine through a cabin window and noted vapour and fluid venting from the labyrinth vent. He decided to continue the flight while monitoring oil pressure and quantity. About three minutes later, while the aircraft was climbing through 12,000 feet above sea level, the turbine inlet temperature and horsepower on the number two engine began to decrease. The power level was advanced to maximum, and the temperature datum control was switched to NULL/OFF, with no effect.

About 15 minutes after take-off, when the number two engine power had decreased to about 200 hp, the crew feathered the propeller and shut down the engine. The pilot aborted the flight and returned to the Moncton Airport.

PERTINENT INFORMATION:

During an engine run-up prior to the incident flight, the number two engine failed to produce take-off power. A maintenance crew checked the engine and repaired four holes in the start/bleed manifold. They also repaired the wiring at the canon plug for the number two engine start valve. The incident occurred on the first flight following the repairs.

After the flight, the number two engine was examined, and the magnetic plug and oil filter in the reduction gearbox were checked and found to be clean. The two magnetic plugs and the oil filter in the accessory section were heavily contaminated with metal particles.

The turbine section was removed from the engine, and it was found that the forward turbine bearing (number three) had failed; the outer race was cracked through at right angles to the direction of rotation. When the turbine was disassembled, it was found that the rear (number four) turbine bearing and bearing support were heavily damaged.

Further disassembly revealed that there was mid-span failure of three or more second stage turbine blades followed by extensive foreign object damage. Three of the blades had broken off in the mid-span area. Three non-failed blades had clearly visible cracks in the mid-span area. Those six blades were examined in a laboratory, and the blade cracking was found to be interdendritic with no obvious corrosion at the crack initiation sites. These cracks could not have been attributed to any impact in the crack vicinity. There was no indication of creep void damage or mechanical discontinuity.

The failed blades, P/N 6786532, had been air cast from GMR 235 material and had a failure history that necessitated the introduction of replacement blades, P/N 6897496 and P/N 6898192. The new blades are to be installed on a "use stock basis" as per Allison Advance Engineering Bulletin ATP-18517; Commercial Engine Bulletin 72-385 for the P/N 6897496 blade; and Advance Engineering Bulletin ATP-18700 for the P/N 6898192 blade.

The turbine was made by Allison and was model 501-D13, serial number 70111. The time on the turbine since overhaul was 3,427 hours.

ANALYSIS:

It is concluded that the second stage blades failed first and caused a dynamic imbalance that resulted in failure of the number three bearing and damage to the number four bearing (rear turbine) and bearing support.

The turbine blades failed as a result of progressive interdendritic cracking in the mid-span area, driven by a mechanism-like stress corrosion cracking. Surface and section analysis of the blades did not detect creep voids or other mechanical discontinuities.

The absence of creep void damage together with the interdendritic cracking would indicate that the failure took a significant operating time to develop.

CONCLUSIONS:

Findings:

1. The number two engine lost power during climb after take-off.

2. The second stage power turbine blades failed as a result of mid-span interdendritic cracking.

3. Failure of the turbine blades resulted in extensive internal engine damage.

4. The failed blades were P/N 6786532 which had a failure history that necessitated replacement on a "use stock basis" with blades P/N 6897496 and P/N 6898192.

Causes:

The engine lost power as a result of turbine blade failure caused by interdendritic cracking.

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WALSTEN AIR SERVICE (1986) LTD.
PIPER PA-18 SUPER CUB C-GYII
OAK LAKE, ONTARIO
21 AUGUST 1987

BRIEF NUMBER: 87-C74068 (Incident)
LOCAL TIME: 1330 CDT
OPERATION: Charter
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	245	50
LAST 90 DAYS	70	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was sailing the aircraft across a strong wind to get to clear water for take-off. He sailed close to and in

the lee of a small, treed island, and, as he cleared the island, the wind slowly rolled the aircraft over. The pilot applied full opposite aileron and rudder but was unable to prevent the roll-over.

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AQUILA AIR LTD.
PIPER PA-23-250 AZTEC C-GQOL
VANCOUVER INTERNATIONAL AIRPORT,
BRITISH COLUMBIA
22 AUGUST 1987

REPORT NUMBER: 87-P70072 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1114 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	926	145
LAST 90 DAYS	348	145

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

Just before the aircraft lifted off from runway 26 at Vancouver International Airport, British Columbia, the nose gear collapsed, and the propellers struck the runway; the pilot pulled back on the control column and climbed the lightly loaded aircraft to 600 feet above ground level. As the aircraft climbed, the pilot retracted the gear and informed the tower controller that he had a problem and that he would be returning to land. The tower controller suggested that he try to sort the problem out prior to returning for a landing. The pilot then observed oil streaming from the front of the left engine and shut the engine down. With the left propeller feathered, the pilot found he could not maintain altitude, and he informed the tower that he was returning to the airport and that he would be making an emergency landing on runway 30. The pilot then attempted to lower the landing gear with the emergency hand pump but found he was unable to complete this task before the aircraft contacted the ground short of runway 30. On ground contact, the landing gear folded back into the wheel wells, and the aircraft slid to a stop on the grass with minimal further damage.

After the accident, it was found that both propellers had been severely damaged; the tips of the left propeller blades were curled, and the propeller dome was cracked. This allowed the engine oil to escape and spray out over the engine. The right propeller lost six inches from the tip of each blade and was curled at the broken ends. There was a 12-inch-long dent in the forward baggage door where one of the broken tips had struck the aircraft.

On take-off, the propellers struck the runway at about its mid-point, and there was over 5,000 feet of runway remaining.

After the accident, the aircraft was placed on jacks, and gear retraction tests were carried out on the aircraft in accordance with the Piper Aztec Service Manual. It was found that the nose gear could be pushed out of the overcentre lock with hand pressure alone. There was an internal leak at the nose gear that allowed the hydraulic pressure to drop to 350 pounds per square inch (psi) within one minute and to 150 psi within three minutes. The aircraft's Service Manual requires that the pressure be maintained at a minimum of 700 psi for 10 minutes. Loss of pressure allows the nosewheel to partially extend in flight and causes the gear-up light to extinguish; it also allows the nose gear to retract on the ground if the overcentre locks are disturbed.

The pilot and the aircraft engineer reported that the gear-up light had occasionally gone out during flight, and, if the gear was recycled, this light would come back on. During the last 100-hour inspection, a gear retraction check had been carried out, but, as a leakage test was not done, the reason for the occasional in-flight dropping of the gear from the full-up position was not found or resolved.

The aircraft had been parked for one and one-half hours prior to flight, and this would have allowed the hydraulic pressure to drop to zero because of the internal leak in the system. During the take-off roll, the pilot was maintaining forward pressure on the control column, and, just before rotation, the nose gear probably hit a bump, disturbing the overcentre lock and allowing the nose gear to collapse and the propellers to strike the runway. When the propellers struck the runway, the pilot could have closed the throttles and stopped the damaged aircraft within the remaining 5,000 feet of runway. Once airborne, with the left engine feathered and the right propeller severely damaged, the aircraft would not maintain altitude, and the pilot attempted to return to land on runway 30.

CONCLUSIONS:

Findings:
1. The hydraulic system of the aircraft had an internal leak.

2. Just prior to rotation, the nose gear collapsed, allowing the propellers to strike the runway.

3. The damaged left propeller dome allowed engine oil to escape, requiring the pilot to shut down the left engine.

4. The damage to the right propeller was so severe that the aircraft could not maintain altitude, and a forced landing followed.

5. Previous reports of the gear dropping out of the full-up position in flight and requiring recycling had not been investigated.

6. The pilot elected to continue the take-off with the damaged aircraft, although adequate runway was available for stopping.

Causes:
The nose gear of the aircraft collapsed on take-off because of an internal hydraulic leak which allowed the down-lock pressure to drop to zero.

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IMP GROUP LIMITED
ROCKWELL 690A AERO COMMANDER C-GIAA
HALIFAX INTERNATIONAL AIRPORT
HALIFAX, NOVA SCOTIA
23 AUGUST 1987

REPORT NUMBER: 87-A74089 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1420 ADT
OPERATION: Charter
DAMAGE: Nil
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	8,100	1,050	5,500	350
LAST 90 DAYS	40	40	65	65

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft was returning to Halifax, Nova Scotia after a charter flight to take some passengers to Sydney, Nova Scotia. During roll-out after landing, the left engine spooled down to zero rpm; smoke and flames were then seen in the exhaust stack area. The co-pilot exited the aircraft and attempted to put the fire out by rotating the propeller by hand but found that the engine was seized. Crash Fire-Fighting and Rescue personnel arrived and sprayed fire retardant into the engine, extinguishing the fire. There was no fire damage to the exterior of the engine or to the aircraft.

The inter-stage turbine temperature (ITT) on the left engine had been higher than normal for the previous several months. A review of the engine readings taken during cruise flight indicated that six flights were flown with ITT readings on the left engine above maximum. Also, the left engine was developing less shaft horsepower and operating at a higher ITT than the right engine when the fuel flows were matched for cruise flight.

The engineer responsible for the maintenance of the aircraft had assumed that the high ITT readings on the left engine were erroneous. On at least one occasion, maintenance personnel had switched the ITT gauges with each other, but the left engine still indicated a higher than normal ITT. Numerous operation checks were conducted, and the left engine consistently ran at a higher ITT and produced less torque than the right engine. On some of these ground runs, the left engine ITT was above maximum allowable limits. The left engine also had a history of hung starts and sometimes required three or more attempts before a start was successful.

The maintenance personnel considered replacing the left engine fuel control unit (FCU); however, this was not done, and there is no record of any maintenance action being taken to rectify the problem. The flight crews were told by the maintenance personnel that the ITT problem was in the indicating system, and the crews were instructed to disregard the high ITT on the left engine. The pilots believed that management knew about the problem, and their concerns about job security made them reluctant to question the maintenance decision.

A teardown inspection of the left engine by the manufacturer revealed that it had been subjected to high internal temperatures which had damaged the power turbine. The fuel control and fuel enrichment valve assembly were removed for functional testing; the test results indicated that the enrichment valve assembly caused excessive fuel flow during engine start operation, which led to high turbine temperatures during the starts.

The continued operation of the left engine with high ITT resulted in heat damage to the power turbine assembly and eventually to seizure of the assembly. The flight crew continued to accept the aircraft, even though the engine gauges showed above-limit readings, and maintenance personnel did not rectify the known defects.

CONCLUSIONS:

Findings:
1. Maintenance personnel did not rectify the known defect in the left engine.

2. Maintenance personnel advised the flight crews to disregard the ITT indications on the left engine.

3. The flight crew accepted the aircraft for flight with a known defect in the left engine.

4. The flight crew operated the left engine with high ITT, which resulted in heat damage to the turbine assembly and eventually to seizure of the assembly.

Causes:
The aircraft was operated with a defect which caused excessive internal engine temperatures.

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DE HAVILLAND DHC 2 BEAVER C-FNML
FINDLAY RIVER, BRITISH COLUMBIA
23 AUGUST 1987

BRIEF NUMBER: 87-P70074 (Accident)
LOCAL TIME: 1145 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	9,770	2,300
LAST 90 DAYS	270	110

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

During the take-off run on a swiftly flowing river, the float-equipped aircraft swung to the left as it came up on the step, and the pilot rejected the take-off. As the aircraft slowed, it was swept toward the shore by the current until the left wing tip brushed a willow tree. The aircraft then swung into the shore, and the left wing and both floats were substantially damaged. The take-off was against a 20-mph current in calm wind.

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ATLIN AIR LTD.
CESSNA A185F SKYWAGON C-GBTJ
ATLIN, BRITISH COLUMBIA
25 AUGUST 1987

REPORT NUMBER: 87-W74091 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1030 PDT
OPERATION: Charter
DAMAGE: None
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,500	1,800
LAST 90 DAYS	500	500

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot of the float-equipped aircraft observed a loose blade retention snap ring hanging on one propeller blade during a walk-around. The blade was found to be loose, and, when the hub was checked, a large crack was observed.

An examination by the Canadian Aviation Safety Board Engineering Laboratory determined that the hub exhibited a high-cycle fatigue crack that originated at a nick in a bearing insertion slot. The nick would have occurred during installation of the blade bearing races, resulting in a stress concentration in the hub and subsequent fatigue cracking.

CONCLUSIONS:

Findings:
1. A crack in the propeller hub resulted from high-cycle fatigue.

Causes:
The propeller hub was nicked during assembly, resulting in a stress concentration and subsequent fatigue cracking.

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CANADIAN AG AIR SERVICES LIMITED
WSK PZL-MIELEC PZL-M-18
DROMEDARY C-GVUD
LONGLAC, ONTARIO 17 mi SE
25 AUGUST 1987

BRIEF NUMBER: 87-O/70063 (Accident)
LOCAL TIME: 0750 EDT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,003	312
LAST 90 DAYS	51	51

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

After completing a spray run, the pilot landed the aircraft on a gravel roadway. Half-way through the landing roll, the left main wheel brake locked, and the aircraft swung left onto soft ground, tipped up on its nose, and overturned.

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CESSNA 172M SKYHAWK C-GPHV
ST. THOMAS, ONTARIO
03 SEPTEMBER 1987

BRIEF NUMBER: 87-O/70067 (Accident) .
LOCAL TIME: 1630 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	170	20
LAST 90 DAYS	6	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The pilot returned to the airport after a two and one-half hour local flight. She misjudged the first approach and elected to overshoot. On the second approach, the pilot initiated the landing flare too high above the runway, and the aircraft dropped and landed hard on the runway. Damage to the firewall and belly skins, in the area of the nose landing gear attachment, was noted after the aircraft was taxied to the hangar.

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CESSNA R172K HAWK XP C-GQQU
LAC DES ÉCORCES, QUÉBEC
04 SEPTEMBER 1987

REPORT NUMBER: 87-Q70042
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1805 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	215	N/A
LAST 90 DAYS	3	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The pilot, who was flying solo, took off from Montebello, Québec in a rented float-equipped aircraft on a visual flight rules (VFR) pleasure flight to his summer cabin on Lac des Iles, Québec, 47 miles to the northeast. Approximately 15 minutes later, the aircraft was observed flying in gradually descending orbits which continued until the aircraft crashed into Lac des Écorces, approximately nine miles to the left of his proposed track. The pilot received injuries, and the autopsy showed that he died by drowning.

PERTINENT INFORMATION:

The weather at the time of the accident was suitable for VFR flight, with unrestricted visibility and a cloudless sky. The wind was calm.

Lac des Écorces is located about half-way to the pilot's intended destination but is approximately nine miles to the left of the proposed track. The pilot had flown this route several times and was therefore familiar with it.

When initially observed, the aircraft was approximately 1,000 feet above ground level (agl). The aircraft struck the water in a right-wing-low, nose-down attitude, after completing four wide right-hand orbits. The crash occurred on the north side of the lake in a small bay which, while usable, does present hazards and obstacles,

rendering it much less suitable for a floatplane landing than the main lake. The aircraft's attitude remained essentially constant throughout the orbits, until water impact.

There was no evidence of any mechanical problems or malfunction of the flight controls prior to the accident. The right elevator torque tube to adaptor rivets were found to be sheared. The engine was developing power upon water impact, and the engine noise was constant until water contact.

The pilot was ejected from the aircraft upon impact. The autopsy revealed that the pilot had severely occluded and hardened arteries and that he had suffered at least one heart attack previous to this accident. Regular medical examinations for his pilot's licence did not detect the pilot's heart condition.

ANALYSIS:

The manner in which the aircraft orbited is suggestive of an aircraft trimmed in cruise flight which is then suddenly put into a bank without any further control input. In such a case, the aircraft would begin to make a wide orbit, and, due to the aircraft's lift vector being deflected, the aircraft would begin to descend. The rate of descent would be determined by the bank angle and would remain relatively constant until a further control input was made. The engine would run at a constant power setting until the throttle was moved.

Lac des Écorces is considered usable for float-equipped aircraft; however, the small bay in which the aircraft crashed is restricted and presents hazards, and, for this reason, it is unlikely that the pilot was attempting to land there. As there was no evidence of any problems with the aircraft's controls, the lack of any change in the aircraft's attitude during its orbiting descent indicates that the pilot was not controlling the aircraft. The attitude of the aircraft when it struck the water and the steady engine noise confirm that the pilot was not in control of the aircraft during its final descent. Additionally, given the actual weather conditions, it is difficult to explain why the pilot was off course by nine miles, on a short flight, and on a track with which he was familiar.

The cause of the right elevator torque tube to adaptor rivets being sheared was found to be the force of the water on the elevator.

Assuming that the pilot was not controlling the aircraft and taking into account the condition of his heart, as determined by the autopsy, it is probable that the pilot became incapacitated due to heart problems, causing him to lose control of the aircraft.

CONCLUSIONS:

Findings:

1. There was no evidence of any mechanical problems or malfunction of the flight controls prior to the accident.

2. The autopsy showed that the pilot had suffered at least one heart attack previous to the accident and suffered from marked arteriosclerosis.

3. Regular medical examinations for his pilot's licence did not detect the pilot's heart condition.

4. The aircraft was not controlled by the pilot during the orbiting descent and landing.

5. The aircraft crashed into the lake.

Causes:

The pilot probably became incapacitated due to heart problems, causing him to lose control of the aircraft.

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EDMONTON FLYING CLUB
CESSNA 152 C-GUZI
CHERHILL, ALBERTA 5 mi S
07 SEPTEMBER 1987

REPORT NUMBER: 87-W70060 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1815 MDT
OPERATION: Flying Club Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	295	150
LAST 90 DAYS	45	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot was attempting to take off on a narrow gravel road oriented in an east/west direction. The aircraft, with 10 degrees of flap selected, became airborne at 45 knots in a nose-high attitude and struck a bush with the left wing. The pilot attempted to turn right, away from the bushes and taller trees, by banking to the right, but he lost directional control when the left wing stalled and struck some trees; the aircraft then veered into the ditch.

The gravelled portion of the road measured approximately 12 feet across. The first 1,000 feet of roadway used for take-off was relatively unobstructed; however, bushes and trees obstructed the left-hand side of the take-off path beyond that point.

The Cessna Pilot's Operating Handbook for the Model 152 indicates that, with 10 degrees of flap selected, the stall speed is 40 knots and that the ground roll on a short-field take-off using 10 degrees of flap on a dry surface is 955 feet. The pilot had limited short-field take-off experience.

When the aircraft became airborne near the stall, while in a nose-high attitude, the pilot banked the aircraft to the right, thus increasing the angle of attack on the left wing, causing it to stall. The descending left wing then contacted some trees, causing the aircraft to veer left into the ditch. The pilot's control inputs were not effective in avoiding the trees and maintaining directional control of the aircraft.

FINDINGS:

Cause Related:
1. Bushes and trees bordering the left side of the road obstructed the take-off path.

2. The pilot banked the aircraft to the right, causing the left wing to stall and strike the trees.

3. Directional control was lost, and the aircraft veered into the ditch.

Other:
-Nil-

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SKYWARD AVIATION LTD.
BRITTEN NORMAN 2A-26 ISLANDER C-GSAD
GODS RIVER, MANITOBA
08 SEPTEMBER 1987

BRIEF NUMBER: 87-C74072 (Incident)
LOCAL TIME: 1430 CDT
OPERATION: Charter
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,547	700
LAST 90 DAYS	289	289

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was landing on a gravel strip, approximately 1,200 feet in length. Because the strip was somewhat wet and slippery, the pilot elected to employ soft-field landing techniques, and he flew a low, power-on approach. The aircraft touched down 10 feet short of the runway threshold, and the left main wheel struck slightly rising terrain. The wing skin near the left wing root was wrinkled, indicating possible structural damage.

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SKYWARD AVIATION LTD.
BRITTEN-NORMAN 2A-26 ISLANDER C-FXYK
YORK FACTORY, MANITOBA
09 SEPTEMBER 1987

REPORT NUMBER: 87-C70076 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 2130 CDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,110	330
LAST 90 DAYS	288	213

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	5

SUMMARY REPORT:

The aircraft was on a visual flight rules (VFR) charter flight from Gillam to York Factory, Manitoba. On arrival at York Factory, the pilot completed two orientation procedures over the runway, and the runway was visible through a thin undercast. During the approach to the short, grass and clay strip, the visibility was less than one mile. When the aircraft was about 500 feet from the threshold and at an altitude of 200 feet above ground level (agl), the pilot lost sight of the far end of the runway, and he applied power to overshoot. The aircraft yawed and turned to the left, and the pilot believed he had lost left engine power. He abandoned the missed approach and landed the aircraft on the runway. Directional control was lost, and the aircraft slid off the runway, fracturing the nosewheel. There were no injuries.

The weather en route was satisfactory. On arrival at destination, the weather in the area varied from 5,000-foot agl scattered conditions with visibilities of 15 miles to 300-foot agl overcast ceilings and low visibilities. There was a strong, gusting cross-wind.

No engine discrepancies were found; however, at the time of the occurrence, the temperatures were conducive to carburettor icing. The carburettor heat controls were found in the OFF position.

The pilot was attempting to land in poor weather conditions. When the engine lost power during the overshoot procedure, the pilot elected to land on the runway but lost directional control because of the strong cross-wind conditions. No fault could be found with the left engine, but carburettor icing is the most likely possibility.

CONCLUSIONS:

Findings:

1. The left engine lost power during the overshoot attempt.

2. The pilot lost directional control on landing in a strong cross-wind.

3. The carburettor heat controls were found in the OFF position.

4. Carburettor icing was the probable cause of the loss of power.

Causes:

During the attempted overshoot, the left engine lost power, probably due to carburettor icing. On touchdown, directional control was lost because of the strong cross-wind.

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AIR NORTH CHARTER
DOUGLAS DC-3 C-GZOF
PLATA STRIP, YUKON
18 SEPTEMBER 1987

REPORT NUMBER: 87-W70063

	Pilot-In-Command	Co-Pilot
Pilot Licence	Airline Transport	Commercial
Total Flying Time	16,000 hr	2,000 hr
Total on Type	8,500 hr	260 hr
Total Last 90 Days	300 hr	310 hr

Injuries	Crew	Passengers	Other	Total
Fatal	-	-	-	-
Serious	-	-	-	-
Minor/None	2	-	-	2
Total	2	-	-	2

HISTORY OF THE FLIGHT:

The aircraft was carrying a load of drilling equipment from Mayo Airport, Yukon to a camp at Plata Strip, Yukon. The pilot approached the airstrip from the southwest for a full-flap landing on runway 06. On touchdown, the aircraft bounced hard; the pilot made two attempts to keep the aircraft on the runway, and, on the third touchdown, the crew heard a loud crack, and the left wing settled onto the ground. The aircraft then slewed to the left and came to rest on the left edge of the runway. The flaps were selected up on initial touchdown.

The accident occurred at 1100 Pacific daylight time (PDT) during the hours of daylight, at lat 63°31′N, long 132°10′W, at an elevation of 2,640 feet above sea level (asl).

PERTINENT INFORMATION:

The tire marks observed near the crests of the undulations in the touchdown area indicate that the aircraft bounced first 120 feet, then another 386 feet along the runway before the left propeller struck the runway surface.

It was determined that, previous to the accident, the aircraft had been stuck in the mud at Haines Junction, Yukon, with the left wheel reportedly mired up to the axle. The freight was not unloaded, nor was the aircraft de-fuelled prior to towing it out. Boards were placed in front of the wheels, and a chain was attached to the strut near the axle on both sides. A Caterpillar tractor was used to pull the aircraft out. It was reported that, after

the aircraft was towed, the locking spade on the left gear was found to be broken and the ground lock pin was difficult to remove. This damage was subsequently repaired.

The correct technique to recover from a bounced landing in this type of aircraft is to apply sufficient power to arrest the rate of descent before the next touchdown, or to initiate an overshoot with full power.

ANALYSIS:

The analysis focuses on the weight and balance of the aircraft, the runway conditions, the structural integrity of the left main landing gear, and the pilot's bounced landing recovery technique.

Removal of the freight from the aircraft prevented investigators from confirming the actual landing weight and centre of gravity (C of G) of the aircraft at the time of landing.

The portion of the runway used for landing was rough and undulating, with depressions and crests. The heavy tire imprint and propeller slash marks on the runway surface at the point of the third touchdown indicate that there was sufficient overload on the left gear at that time to collapse the gear. The examination of the left landing gear by the CASB Engineering laboratory did not reveal any indications of previous damage.

The pilot did not apply sufficient power to arrest the descent, nor did he attempt to go around after the bounced landing. Instead, he elected to lower the nose in an attempt to keep the aircraft on the runway; this technique resulted in a heavy landing after the second bounce and caused the landing gear to collapse.

CONCLUSIONS:

Findings:
1. The runway surface was rough and undulating.

2. The aircraft bounced on landing.

3. After bouncing twice, the pilot elected not to go around or apply power to assist in the round-out for touchdown.

4. The aircraft landed heavily, resulting in the collapse of the left main gear.

5. The aircraft landing weight and C of G at the time of the accident could not be confirmed.

6. The crew was certified and qualified for the flight in accordance with existing regulations.

7. The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

8. There was no evidence found of any airfame failure or system malfunction prior to or during the flight.

Causes:
The pilot did not use the appropriate bounce recovery technique.

SAFETY ACTION:

The Board has no safety recommendations to issue at this time.

CESSNA 305 N64836
HARDY BAY, BRITISH COLUMBIA
21 SEPTEMBER 1987

BRIEF NUMBER: 87-P70910 (Accident)
LOCAL TIME: 1015 PDT
OPERATION: Private
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,024	544
LAST 90 DAYS	257	257

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

After landing at Hardy Bay, British Columbia, the pilot discovered that one of the aircraft's floats was leaking. The float was repaired, and the next day, the pilot prepared to continue his flight to Bellingham, Washington. On take-off, just before the aircraft became airborne, the left float struck a submerged object. The pilot rejected the take-off, and, when the aircraft slowed, it rolled over onto its back. The aircraft was damaged by the salt water; the pilot was uninjured.

PEZETEL M-18, DROMADER C-GMVL
FREDERICTON, NEW BRUNSWICK
27 SEPTEMBER 1987

BRIEF NUMBER: 87-A70033 (Accident)
LOCAL TIME: 1800 ADT
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,200	1
LAST 90 DAYS	250	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was on his initial check-out on this type of aircraft and was practising touch-and-go landings on runway 33. The wind was 300 degrees magnetic at 15 to 20 knots, creating a cross-wind from the left. During an attempted three-point landing, the aircraft touched down heavily, and the right wing tip struck the runway.

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URSUS AVIATION
CESSNA A185F SKYWAGON C-GTPA
FORT NORMAN, NORTHWEST TERRITORIES
16 mi N
06 OCTOBER 1987

REPORT NUMBER: 87-W70068 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1740 MDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	12,000	8,000
LAST 90 DAYS	145	60

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft was on a fuel haul to a lake approximately 45 miles north of its departure point. About mid-way, the pilot encountered deteriorating weather and lost sight of the high terrain directly ahead. An emergency climb using full power, partial flap, and an airspeed just above the stall was carried out; but the aircraft struck a tree-covered hillside at an elevation of 1,350 feet above sea level (asl), coming to rest upright, in a nose-down attitude; the top of the hill was 1,700 feet asl. Because of the inflammable load, the pilot attempted to get out of the aircraft at once; however, both doors were jammed closed. He kicked out a window and was able to escape.

After a reasonable length of time and as there was no sign of a fire, the pilot returned to the aircraft; he selected 121.5 megahertz on the aircraft's radio but was unable to hear the emergency locator transmitter (ELT). The ELT was removed from the aircraft, and several attempts were made to confirm that the ELT was transmitting. The portable ELT antenna was reported to have been in the glove compartment box; however, this was damaged by impact, and the pilot could not find the antenna. Since the antenna was missing, the range of the ELT was only a few feet. Uncertain about whether the ELT was transmitting or not and with the weather deteriorating, the pilot, aware of his position, attempted to walk to safety. A search was carried out by civilian and military aircraft, and the pilot was rescued about 48 hours later.

Prior to the accident flight, the pilot had made three other flights that day in the same area. The weather was described as a 1,000-foot ceiling with five to six miles visibility. To the west of the pilot's track, the visibility was reduced to about one quarter of a mile in snow showers. The pilot flew to the west in order to find a bush trail that would take him to the lake where he was to dump the fuel. He was flying at 1,000 feet asl when he lost visual reference with the foot of the hill.

The pilot listened on the aircraft's radio but could not hear the ELT transmitting. Several attempts were made, both manually and automatically, to activate the ELT, but with the same negative results. The pilot then decided to walk to safety and carried the ELT with him. During his walk and especially during those times when he heard aircraft flying over, he again attempted to activate the ELT, which included holding his axe or rifle next to the ELT, in hopes that it would act as an antenna. When tested by the Canadian Aviation Safety Board, using a proper antenna, the ELT operated normally in both the automatic and manual mode.

A post-crash examination of the aircraft log books revealed that the required aircraft Condition and Conformity Inspection (CCI) had not been carried out, and therefore the aircraft's Certificate of Airworthiness (C of A) was invalid.

While flying in poor weather conditions, the pilot lost sight of the ground; he attempted to clear the known

higher terrain along his flight path but was unable to do so, and the aircraft struck the hill.

CONCLUSIONS:

Findings:
1. The pilot attempted flight into adverse weather conditions and lost visual reference with the terrain.

2. Upon losing visual reference, the pilot attempted to clear the rising terrain using emergency climb procedures.

3. The aircraft struck the hill about 400 feet below its summit.

4. The pilot, suspecting that the ELT was not transmitting, attempted to walk to safety.

5. The ELT functioned normally in both the automatic and manual modes when tested after the accident.

6. The aircraft's C of A was not valid because the required aircraft CCI had not been carried out.

Causes:
The pilot continued flight into deteriorating weather conditions.

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COLLISION BETWEEN:
PIPER PA-23-250 AZTEC C-GUHP and
PIPER PA-31-310 NAVAJO C-GBOH
MONTRÉAL/DORVAL AIRPORT, QUÉBEC
08 OCTOBER 1987

REPORT NUMBER: 87-Q70801 (Accident)
LOCAL TIME: 0618 EDT
INFORMATION SOURCE: Field Investigation

PIPER PA-23-250 AZTEC C-GUHP

OPERATOR: Aviabec (1987) Inc.
OPERATION: Charter
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	8,600	1,000
LAST 90 DAYS	50	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

PIPER PA-31-310 NAVAJO C-GBOH

OPERATOR: Air Charters Ltd.
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,250	500
LAST 90 DAYS	300	295

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

While taxiing near the intersection of runway 24 Left and taxiway Roméo, the Piper Aztec struck the left wing of the Piper Navajo, which was stationary, awaiting clearance for take-off.

The pilot of the Piper Navajo stated that he was stopped in the middle of taxiway Roméo at the approach end of runway 24 Left, waiting for the aircraft ahead of him to take off when his aircraft was struck by the Piper Aztec. The pilot of the Piper Navajo had been cleared to use taxiway Roméo as far as the approach end of runway 24 Left. The pilot had positioned the Navajo at a 45-degree angle across the taxiway and to the left of another aircraft in order to carry out his engine run-up. He then requested clearance to take off in sequence before positioning his aircraft on the approach end of the runway. Although all three aircraft were on the control tower frequency, the pilot of the Piper Aztec did not hear this request. He had been cleared to use the same taxiway and to follow the Piper Navajo.

The pilot of the Piper Aztec stated that when he saw the two airplanes ahead of him, the Piper Navajo was parked at an angle, about 45 degrees to his right. As neither airplane appeared ready for take-off, the pilot of the Aztec requested clearance to take off. While waiting for take-off clearance, the Aztec pilot continued his before-take-off checks and allowed his aircraft to roll along the left side of the taxiway to get ahead of the Navajo on his right. During the roll, the Aztec pilot suddenly noticed that the Navajo was in front of him. He applied the brakes and shut down power to the right engine. The right propeller of the Aztec struck the left aileron of the Navajo.

In the area where the Navajo and Aztec were located, the taxiway is 75 feet wide. It is not possible to pass an aircraft as large as a Navajo while it is positioned on the centre line of the taxiway.

The surface of the taxiway was wet. It was dark and a light rain was falling, and the Piper Aztec had no windshield wipers. The braking system on the Aztec was checked, but no irregularities were found. The pilot of the Aztec was qualified and cleared for his intended flight.

The pilot of the Aztec, not having heard what the Navajo pilot intended to do, signified his intention to take off ahead of the two aircraft in front of him. While waiting for his take-off clearance, the Aztec pilot allowed his aircraft to roll along the left side of the taxiway, even though it was dark, visibility was reduced by the light rain, and he was busy doing his before-take-off checks. The pilot of the Piper Aztec did not see that the pilot of the Navajo had repositioned his aircraft in preparation for a take-off in sequence. The Aztec pilot did not check to ensure that he had enough room and was unable to stop his aircraft in time to avoid striking the wing of the Piper Navajo.

CONCLUSIONS:

Findings:

1. It was dark, and the Piper Aztec pilot's vision was reduced by a light rain on the aircraft's windshield.

2. The pilot of the Piper Aztec did not hear the pilot of the Piper Navajo stating his intention to take off.

3. While completing his before-take-off checks, the pilot of the Piper Aztec did not ensure that the taxiway ahead of him was clear, and his aircraft struck the Piper Navajo, which was awaiting take-off clearance.

Causes:

The pilot of the Piper Aztec was completing his before-take-off checks and did not ensure that the taxiway ahead of him was clear.

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CENTRAL MOUNTAIN AIR SERVICES LTD. DE HAVILLAND DHC-2 BEAVER C-FGQN SMITHERS, BRITISH COLUMBIA 9 mi E 10 OCTOBER 1987

REPORT NUMBER: 87-P70091
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1135 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,730	248
LAST 90 DAYS	418	183

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The cargo flight departed the company float base on Tyhee Lake, six miles east of Smithers, British Columbia for a drilling camp on Tsayta Lake, 75 miles to the northeast. About eight minutes after take-off, the pilot radioed to the Smithers Flight Service Station that the aircraft's engine had failed and that he was going to land in a farmer's field. The aircraft was found six miles from Tyhee Lake where it had crashed; the pilot was fatally injured.

PERTINENT INFORMATION:

The accident occurred during the late morning of a warm fall day. The wind was light and variable, some mid-level cloud was present, and the visibility was unlimited. The temperature at the Smithers Airport, eight miles west of the float base, had fallen to the freezing point during recent nights and then increased to 12 to 13 degrees Celsius during the days.

Company pilots normally used fuel from the aircraft's front tank for the engine start and for take-off. After take-off, fuel was burned from the rear tank and then from the centre tank. After completion of each trip, refuelling of the aircraft was the responsibility of the pilot who was assigned the next flight.

The pilot who had flown the aircraft previous to the accident flight said that he always checked the aircraft's fuel tanks for water contamination and that he had never found any. He also said that, after the completion of his last flight, the rear fuel tank was empty, the centre tank was nearly empty, and the front tank was half full.

The company had two fuel storage tanks, one above ground and one underground. Both tanks were capable of supplying fuel to aircraft through connecting pipes, a selector valve, and a delivery hose that was fitted with a sump. The company pilots reported that they were using fuel from the underground storage tank in recent weeks, and, during that time, no fuel had been used from the other tank.

When the fuel storage tanks were examined, the selector valve was found positioned to the above ground storage tank, and it is believed that the pilot filled the aircraft's front and centre tanks from this source. The aircraft's rear tank was not filled because that quantity of fuel was not required.

When the aircraft's fuel system was examined after the accident, water was found in the centre fuel tank but not in the front tank; water was also found in the fuel strainer, the engine driven fuel pump, the carburettor, and the induction system. The position of the aircraft's fuel tank selector at impact could not be determined due to crash damage. When the company's fuel storage system was examined, water was found in the delivery line fuel sump. This sump retained some water but did not prevent water from being delivered from the storage tank.

There was no evidence of mechanical problems with the engine, and the aircraft maintenance log book contained no record of uncorrected engine problems.

As the aircraft descended after its engine stopped, witnesses heard a sound that led them to believe the pilot was attempting to restart the engine with the starter motor. He overflew a suitable landing area and crashed into an area obstructed by trees, telephone poles, and wires.

ANALYSIS:

The evidence shows that the aircraft was refuelled from the above ground tank and that the fuel was contaminated with water. The fact that, after the accident, water was found in the aircraft's centre fuel tank but not in the front fuel tank, indicates that the pilot filled the centre tank first and that all the water in the storage tank went into the aircraft's centre tank. This is supported by the fact that the engine ran without problems during the start, taxi, and take-off, which were normally performed with the front tank selected, and the fact that the engine failed in the climb at the time when the centre tank was normally selected.

When the engine stopped, there was insufficient altitude to allow time for the water in the engine to clear and for the engine to be restarted before the aircraft struck the ground.

Because there was evidence of a relatively large amount of water in the fuel system after the accident, it is probable that the pilot did not check the fuel drains for water before take-off as he would have seen water in the samples and taken the appropriate measures to remove all the water from the fuel system.

The pilot intended to make a forced landing in a farmer's field, but, probably because he was concentrating on restarting the engine, he missed the opportunity to land in the field, and he was then forced to land in an unsuitable area.

CONCLUSIONS:

Findings:

1. The fuel storage tank from which the aircraft was refuelled was contaminated with water.

2. The aircraft's centre fuel tank and fuel system were contaminated with water.

3. The aircraft's engine stopped because of water-contaminated fuel.

4. The pilot overflew an open field and made the forced landing in an unsuitable area.

Causes:

The engine lost power because of water-contaminated fuel.

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VOYAGEUR AIRWAYS
PIPER PA-31T CHEYENNE C-GSID
KIRKLAND LAKE, ONTARIO
18 OCTOBER 1987

REPORT NUMBER: 87-O/70083 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1015 EDT
OPERATION: Commercial Non-Revenue
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,600	100
LAST 90 DAYS	180	100

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

During the pre-flight inspection, the captain noted that the right main landing gear door was hanging in the open position. The captain reported that, while taxiing out, he moved the gear handle from the neutral position to the down position. The nose gear retracted, and the aircraft nosed down, resulting in substantial damage to the propellers, engines, and nose bulkhead.

The salvage crew sent to lift the aircraft noted that both the main landing gear was also partially retracted. The aircraft was then put on jacks, the landing gear was locked down, and the gear doors were closed using the emergency hand-pump. The landing gear handle returned automatically to the neutral position when pressure built up at the end of the cycle, as normal. The squat switch was moved to the weight-on-the-wheels position (ground), and a gear-up selection was attempted. The handle could not be moved to the up position, due to the action of the anti-retraction solenoid. The squat switch was then moved to the the weight-off-the-wheels position (air); the handle was then selected up, and the gear retracted. This test confirmed that the anti-retraction system operated correctly at this time.

A further series of tests was carried out on the anti-retraction solenoid, and it was found to occasionally stick in the activated position, which would allow the gear to retract if the selector handle was moved to the up position with the aircraft on the ground.

The selector linkage was examined and found to be intact and properly adjusted.

The hydraulic power pack was removed, tested, and examined at an approved shop. No discrepancies were noted that would have resulted in the gear retraction. Retraction tests carried out on the aircraft following the accident indicated that the hydraulic system was functioning properly at that time.

The salvage crew noted that the landing gear selector lever was found in the neutral position. This position is only reached by the handle following the completion of an up or down gear cycle when the pressure builds up and moves the lever automatically to the neutral position.

The only fault found in the gear retraction system was the intermittent sticking of the anti-retraction solenoid; this by itself would not have caused the gear to retract but would have made it possible for the pilot to select the gear up while on the ground. It was therefore not possible to determine the cause of the gear retracting on the ground.

CONCLUSIONS:

Findings:

1. Pre-flight inspection revealed that the right main landing gear door had opened since the aircraft had been parked.

2. While taxiing out, the captain selected the gear lever down in an attempt to close the gear door prior to take-off.

3. The nose landing gear retracted on the ground, causing the aircraft to nose down and damaging the propellers, engines, and nose structure.

4. Both the right and left main landing gear partly retracted on the ground, but the retraction sequence was not completed.

5. An intermittent fault was found in the anti-retraction solenoid which would allow the gear to retract while the aircraft was on the ground if the selector lever was moved to the up position.

6. The landing gear selector lever was found in the neutral position after the accident.

Causes:

The cause of the gear retraction could not be determined.

RISK OF COLLISION BETWEEN:
MCDONNELL DOUGLAS DC-10 C-FCRA and
MCDONNELL DOUGLAS DC-10 S-EDFE
SCHEFFERVILLE, QUÉBEC
22 OCTOBER 1987

REPORT NUMBER: 87-A74112
LOCAL TIME: 1330 AST
INFORMATION SOURCE: Field Investigation

MCDONNELL DOUGLAS DC-10 C-FCRA

OPERATOR: Canadian Airlines International
OPERATION: Scheduled International
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	N/A	N/A	N/A	N/A
LAST 90 DAYS	N/A	N/A	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	N/A
PASSENGERS	-	-	N/A

MCDONNELL DOUGLAS DC-10 S-EDFE

OPERATOR: Scandinavian Airlines System
OPERATION: Scheduled International
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	N/A	N/A	N/A	N/A
LAST 90 DAYS	N/A	N/A	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	N/A
PASSENGERS	-	-	N/A

HISTORY OF THE FLIGHT:

C-FCRA, operating as Canadian Flight 51, was at flight level (FL) 330 proceeding on a cleared track from Prawn Intersection to Schefferville, Québec, then to Banne Intersection. The crew had estimated Schefferville at 1400 Atlantic standard time (AST)and had requested a climb to FL 350.

S-EDFE, operating as Scandinavian Flight 901, was proceeding over 60°00'N 60°00'W direct to the Schefferville very high frequency omnidirectional range (VOR), then direct to Wabush VOR, while maintaining FL 350. The crew estimated Schefferville at 1358 AST, and Wabush at 1414 AST.

The aircraft were in a non-radar environment.

At 1338 AST, Canadian 51 was cleared by Moncton Area Control Centre (ACC) to climb to FL 350. When the two aircraft passed over Schefferville, both were at FL 350 with two minutes separation instead of the 15-minute separation required under the circumstances. The controller, realizing that a loss of separation had occurred, immediately cleared Scandinavian 901 down to FL330.

PERTINENT INFORMATION:

Canadian 51 and Scandinavian 901 were on assigned tracks which crossed at Schefferville. This area was outside the radar coverage of the Moncton ACC.

Air traffic control data strips for aircraft, which include all pertinent information for control purposes, are displayed on the data boards under each compulsory reporting point. Data strips are removed from under the header of a reporting point when the aircraft has progressed by the next reporting point.

There was another Scandinavian flight operating on a route identical to Scandinavian 901 and using the call sign Scandinavian 911. This aircraft had progressed by Schefferville at 1315 AST and by Wabush at 1330 AST.

At 1323 AST, when Canadian 51 initially requested FL 350, one controller was working the sector. He scanned the data strips under Schefferville, saw Scandinavian 901 as traffic, and did not approve the climb. Shortly after this, he was joined at the sector by another controller who took up the duties of the radio/radar position. Approximately eight minutes later, the original controller was relieved at the data position, but he remained at the sector for about five minutes, during which time he advised the relieving data controller that Canadian 51 was requesting FL 350.

The relieving data controller advised the radio/radar controller that Montreal ACC would require Canadian 51 to enter their airspace at FL 350. The radio/radar controller scanned the data strips under the Schefferville header, saw no data strip indicating conflicting traffic for Canadian 51 at FL 350, and cleared the aircraft to FL 350 at 1338 AST.

Immediately after the separation loss, the supervisor on duty assessed the traffic and saw three strips under the Schefferville header. They were for Canadian 51, an

uninvolved Air Canada flight, and Scandanavian 911. She did not see a data strip for Scaninavian 901. However, under the Wabush header, there were two data strips for Scandinavian 901 and 911.

ANALYSIS:

When Canadian 51 initially requested FL 350 at 1323 AST, the data strip for Scandinavian 901 was displayed under the Schefferville header. At 1330 AST, Scandinavian 911 passed by Wabush, and it was then that the strip on this aircraft displayed under Schefferville should have been removed. The Schefferville strip for Scandinavian 901 was inadvertently removed instead.

When the initial controller was relieved, there was no conflicting traffic with Canadian 51 displayed on the board. With the Schefferville strip on Scandinavian 901 removed, the controller was unaware of the conflict between Canadian 51 and Scandinavian 901 at FL 350. It could not be determined who had removed the strip.

CONCLUSIONS:

Findings:
1. When Scandinavian 911 passed by Wabush, the flight data strip displaying information on Scandinavian 901 under Schefferville was inadvertently removed.

2. When the controller cleared Canadian 51 to FL 350, the flight data strip that would have indicated that Scandinavian 901 was conflicting traffic had been removed from the controller's data board.

Causes:
The flight data strip displaying the information on Scandinavian 901 was inadvertently removed from under the Schefferville header when Scandinavian 911 passed by Wabush.

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MOONEY M20E CHAPARRAL N6097Q
MANKOTA, SASKATCHEWAN 3 mi S
01 NOVEMBER 1987

BRIEF NUMBER: 87-C74904 (Incident)
LOCAL TIME: 0430 CST
OPERATION: Private Ferry
DAMAGE: Minor
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,400	450
LAST 90 DAYS	100	80

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

While on a night visual flight rules (VFR) flight from Forsyth to Havre Montana, the pilot fell asleep. The aircraft gradually deviated to the right and eventually ran out of fuel near Mankota, Saskatchewan. The pilot woke up and carried out a forced landing on a road; the aircraft suffered minor damage. The incident occurred at 0430 central standard time, and the pilot had not rested for 23 hours prior to the flight.

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KENN BOREK AIR LTD.
DE HAVILLAND DHC4A CARIBOU C-GVYX
ROSS RIVER, YUKON TERRITORY
10 NOVEMBER 1987

REPORT NUMBER: 87-W70073

	Pilot-In-Command	Co-Pilot
Pilot Licence	Airline Transport	Commercial
Total Flying Time	6,800 hr	4,000 hr
Total on Type	90 hr	550 hr
Total Last 90 Days	150 hr	205 hr

Injuries	Crew	Passengers	Other	Total
Fatal	2	-	-	2
Serious	-	2	-	2
Minor/None	-	-	-	-
Total	2	2	-	4

HISTORY OF THE FLIGHT:

The de Havilland DHC4A Caribou aircraft, C-GVYX, was en route from Calgary, Alberta to Ross River, Yukon, where it was to be used to transport silver ore

concentrate from the mines at Plata to Ross River. On board were two pilots, two company aircraft maintenance engineers (AMEs) to service the aircraft, and about 5,500 pounds of aircraft parts and equipment to support the operation of the aircraft in Ross River. One refuelling stop was made at Fort Nelson, British Columbia, after which the aircraft proceeded on an instrument flight rules (IFR) flight plan to its destination.

Ross River has no published instrument approach and is situated in a valley in mountainous terrain. For an IFR flight from Fort Nelson to Ross River, it is necessary to overfly Ross River, proceed 30 miles to the northwest and complete a non-directional beacon (NDB) approach at Faro, Yukon where the minimum circling altitude is 5,060 feet above sea level (asl) or 2,709 feet above ground level (agl). When below cloud at Faro, the aircraft may then proceed visually up the river valley to Ross River.

The Caribou arrived over Faro at approximately 1615 Pacific standard time (PST), and an attempt was made to descend below the cloud base which was reported to be 400 to 600 feet agl. When visual reference with the ground was not made, the pilot climbed out to the southeast and informed Faro Community Airport Radio Station (CARS) that he was proceeding to his alternate, Watson Lake.

After the aircraft levelled off in cruise flight, the right engine low-oil-quantity light illuminated. The captain instructed the engineers to look at the engine from the rear of the aircraft to confirm the warning. The engineers reported that oil was being lost from the right engine. Soon after, the right low oil pressure light illuminated. The oil pressure was allowed to drop until the pressure gauge read the minimum allowable, and the right engine was then shut down, and the propeller was feathered.

The route to Watson Lake passed over Ross River, and witnesses on the ground heard the aircraft circling overhead. The aircraft was heard flying out to the southeast for an approach to runway 26 at the Ross River Airport.

One of the two AMEs on board the aircraft was sitting in the jump seat between the two pilots. Although it was getting dark, this passenger could see the ground during the approach and the unlighted runway was clearly visible. Flap was selected to 14 degrees, and, on the approach, the landing gear was lowered, but no green down light showed for the nose gear. In an attempt to rectify the problem, the gear was raised and then lowered again. This time all three green indicators showed that the landing gear was down and locked, but the pilot initiated a go-around. The AME in the jump seat felt that the aircraft was no longer in a position to land by the time a safe indication was obtained on the nose gear.

Witnesses on the ground observed the aircraft overshooting and climbing in a direction about 30 degrees to the right of the runway heading, to the north side of the Pelly River, and then proceed westbound at an altitude of approximately 200 feet, close to and parallel with the north side of the valley. The aircraft passed by the town and then began to lose altitude as it disappeared in the darkness to the west. The tree-covered terrain over which it was flying was about 20 feet above the river, and, as the aircraft descended gradually into the trees, it began to roll to the right. Portions of the right wing were torn off on contact with the trees, and the roll increased to 90 degrees as the aircraft nosed into the ground. The aircraft then cartwheeled over the embankment and down onto the river shore 20 feet below.

A helicopter in the area arrived within minutes and found the two passengers, the only survivors, walking around outside the burning wreckage.

The accident occurred at lat 62°00′N, long 132°28′W at 1713 PST during the hours of darkness at an elevation of 2,320 feet asl.

PERTINENT INFORMATION:

The aircraft had returned to the main base in Calgary on 01 November to have a number of defects rectified, including continuing problems with the reversing propellers. The solution to the propeller problem was to install a completely different system. Part of this change-over included the installation of an engine-driven propeller governor on each engine. When the blanking plate was removed to accommodate the installation of the right governor, the adapter plate also came off. The factory gasket that was between the adapter plate and the engine was torn during the removal of the adapter. No replacement gasket was available in the company stores department. The AME fabricated a temporary rubber gasket to permit rigging of the governor control cable.

The AME stated that, because the gasket was to be replaced upon receipt of an approved gasket, he did not tighten the base nuts. To ensure that the engine would not be operated with the unsuitable gasket, the AME also stated that he placed a tag describing the situation, on the governor. The tag would have been the only means of communication used to identify the unfinished maintenance task. No other person was advised of the loose nuts and temporary gasket, nor was an entry made in the maintenance record.

After the apparent completion of all the required work on the aircraft several days later, a ground run was carried out under the supervision of a different AME. The right propeller governor had a substantial oil leak because of the loose base nuts. The AME found the gover-

nor loose and tightened the base nuts to rectify the problem. At this time, there was no tag on the governor. Following a test flight, a small puddle of oil was observed under the right engine. Although the captain and company chief inspector discussed this oil leak, they did not investigate to determine its source.

On 10 November 1987, the time of official sunset at Ross River was 1621 PST. This was followed by 52 minutes of civil twilight, with the hours of darkness beginning at 1713 PST.

The DHC4A, flying with zero flap, at the recommended single-engine climb speed of 94 knots, would require a bank angle of 18 degrees to turn within the confines of the valley.

Flying with 14 degrees of flap, at the recommended single-engine climb speed of 77 knots, would require a bank angle of 12 degrees to turn within the confines of the valley.

ANALYSIS:

The pilot had initiated a single-engine go-around, and the aircraft had climbed to an altitude of approximately 200 feet agl before descending in a wings-level attitude into the trees. The analysis focuses on why the right engine was shut down and why the pilot was not successful in continuing flight following the single-engine overshoot.

The right engine oil supply was lost because an unsuitable fabricated gasket under the propeller governor adapter plate deformed, allowing pressurized engine oil to escape. The temporary fabricated gasket was not replaced because of a lack of communication between two different AMEs who worked on the right engine. The maintenance tag, the only indication of the abnormal situation, was no longer attached to the engine after the ground run. The use of a maintenance tag to identify unfinished maintenance is a normal maintenance practice. In flight, the crew shut down the engine and feathered the propeller after engine oil had been expended to the point where operating pressure could not be maintained.

The teardown inspection of the left engine did not reveal any discrepancy which would have prevented the engine from producing rated power. Metal particles that were found in the oil screen originated from residual contamination left in the airframe components following the failure of the previous engine. Loss of cylinder compression resulted during the crash sequence as pine needles were ingested into the intake system. This contamination prevented the intake valves from sealing, resulting in low compression readings during the teardown.

As the aircraft passed Ross River en route to Watson Lake, the pilot had visual reference with the ground in an area southeast of the airport and was able to descend visually until he was below the cloud base of about 800 feet. The 800-foot cloud base would allow a visual approach to Ross River to be made; however, the combination of low cloud, night, and the steeply rising terrain surrounding the airport would make it extremely difficult to remain in visual flight conditions should a single-engine overshoot be attempted.

The width of the valley west of the Ross River Airport and the 2,000- to 4,000-foot-high mountains on either side severely restrict the manoeuvring area available to an aircraft on a missed approach. The DHC4A carrying out a single-engine overshoot to runway 26 at Ross River would have had to turn immediately within the confines of the narrow valley in order to attempt a second approach and landing. The only other option would have been to attempt flight into a narrow and twisting valley towards Faro, as darkness approached and the ceiling and visibility rapidly decreased.

The DHC4A aircraft meets applicable certification criteria for single-engine performance (CAR Part 4B). Nevertheless, the procedures required for climbing with a single engine when the aircraft is near its maximum weight leave little margin for error. In particular, the transition to single-engine climb from approach configuration calls for increasing the airspeed and raising the flaps. This is achieved by flying level, foregoing any attempt to climb, and postponing flap retraction until the desired airspeed is attained. Any attempt to turn could inhibit the ability of the aircraft to accelerate. It is assumed the approach, overshoot, and subsequent climb to 200 feet agl were undertaken with flaps at approach setting and at the recommended speed of 77 knots. The flaps were found in the retracted position, and, because the aircraft did not maintain height and descended into the trees, it is concluded the flaps were retracted before the necessary speed increase had been achieved.

After the right engine was shut down, the crew was forced to choose between two unattractive options: continuing the single-engine flight to Watson Lake, a night flight of 150 miles over mountainous terrain; or making a landing attempt sooner at Ross River.

The flight crew decided to attempt a single-engine approach and landing at Ross River in marginal meteorological conditions. The crew evidently did not realize that this decision effectively foreclosed the option of a single-engine go-around should one become necessary. The aircraft did not have sufficient single-engine climb performance to climb above the 2,000- to 4,000-foot-high terrain immediately beyond the end of runway 26. Similarly, it would have been difficult, if not impossible, to execute a safe turn within the valley. The combination

of oncoming darkness and reduced visibility in snow showers would demand even greater concentration from the flight crew.

It is not known if these factors were considered prior to starting the single-engine approach to Ross River. However, if they were, the flight crew should have drawn the conclusion that an overshoot would not likely succeed and therefore should not be attempted. This conclusion would have required discussion between the two pilots and a briefing by the captain that, once the approach was begun, the aircraft would have to be put down on the runway, regardless of any additional abnormal or emergency situations.

CONCLUSIONS:

Findings:

1. The aircraft weight on take-off from Fort Nelson exceeded the certified maximum gross weight of 28,500 pounds.

2. The aircraft weight was below the certified maximum gross weight at the time of the accident, but the centre of gravity could not be determined.

3. The right engine was shut down in flight because of oil exhaustion.

4. Structural deformation of the gasket between the governor pad and the adapter plate caused the oil loss.

5. The rubber gasket that failed was fabricated and installed at the operator's maintenance facility as a temporary measure for maintenance purposes.

6. A lack of communication between two AMEs resulted in the aircraft being dispatched with the unsuitable gasket installed.

7. The right propeller was in the feathered position at the time of the accident.

8. The left engine was determined to have been operating normally.

9. The nose gear down-and-locked indicator light did not illuminate when the gear was selected down on final approach.

10. The pilot cycled the landing gear on short final, which resulted in a gear-safe indication.

11. The pilot initiated a single-engine go-around because the aircraft was no longer in position for a safe landing.

12. A successful overshoot was not likely given the conditions of aircraft weight, single-engine performance, weather, terrain, and darkness.

13. The flaps were raised during the climb-out prior to attaining an adequate airspeed, and, as a result, the aircraft was unable to maintain altitude.

14. flight crew was certified and qualified for the flight.

Causes:

A lack of communication at the company's maintenance facility led to the dispatch of the aircraft with an unsuitable gasket in the right engine, and the subsequent loss of engine oil. A single-engine go-around was attempted when the combination of single-engine performance, a low cloud base, and high terrain surrounding a confined operating area made a successful overshoot uncertain. The flaps were fully retracted before the minimum speed for single-engine flight in the zero flap configuration was achieved.

SAFETY ACTION:

This occurrence underlines some long-standing concerns of the CASB with respect to the effectiveness of Transport Canada's processes for regulatory control of operations and maintenance. Apparently despite the best efforts of Transport Canada, the occurrence record continues to demonstrate a need for a more effective regulatory presence – particularly for companies engaged in remote operations.

After an accident in May 1985 involving a Kenn Borek Air Ltd. aircraft (Report No. 85-W54056), the Government of the Northwest Territories advised the CASB of its concern about the safety record of this company. In July 1985, the CASB advised the Minister of Transport that there was some basis for this concern based upon the company's accident statistics. The Department of Transport subsequently completed a comprehensive audit of the company, culminating in a full range of recommendations which addressed company management practices in flight training, aircraft maintenance, and operational procedures. In light of the positive steps taken or in progress as a result of this audit and review of company operations, the CASB was assured by Transport Canada that the deficiencies in operations and maintenance at the company were being satisfactorily addressed.

Two recommendations resulting from the Transport Canada audit were that "management adopt a more dynamic approach to monitoring all aspects of operations and maintenance" and that "management institute procedures to ensure that aircraft weight limitations are complied with ...."

Notwithstanding these recommendations, the accident aircraft departed Fort Nelson approximately 1,000 pounds heavier than the aircraft certified maximum allowable gross take-off weight. There was also some indication that the engines of the accident aircraft may have been involved in frequent heavy-lift operations; some evidence of overheated cylinders may possibly have been due to over-boosting. Furthermore, since the accident in May 1985, Kenn Borek Air Ltd. has experienced five other incidents in addition to this accident. (Two of the incidents involved materiel defects in the landing gear systems [CASB Report No. 87-C74015 and 88P0269]. The other three incidents raised questions about pilot operating technique [CASB Report No. 86-W64029, 86-W64066, and 87-W74108].)

In May 1988, Transport Canada conducted a routine maintenance audit of the Calgary base of Kenn Borek Air Ltd. Although the company was noted to have "shaped up very well", several discrepancies were noted concerning the need for the company to "ensure maintenance manual procedures are being complied with" and for "engineers to review the procedures in Section IV of the Company Maintenance Manual and Air Navigation Order (ANO) VIII No. 2." The audit also noted that improvement was required with respect to dual inspections being carried out by qualified personnel and being properly certified in the aircraft logs. The audit gave no indication about whether certifications were being made in the journey logs in accordance with ANO II No. 4 or whether all log book entries were in accordance with ANO VIII No. 2 and 3.

The Board has noted several other occurrences which call into question the adequacy of Transport Canada's surveillance, audit, and inspection of operations and maintenance in remote regions. Three years earlier, in October 1984, a Wapiti Aviation Limited Piper PA-31-350 Navajo Chieftain descended in cloud below the minimum obstruction clearance altitude and struck high terrain during an approach to High Prairie, Alberta (CASB Report 84-H40006). In its report, the CASB stated that

"One of the primary safety deficiencies identified in the accident was the inability of TC to respond effectively to the apparent unsafe operating practices of a company, despite an abundance of evidence: in the two years preceding the accident, regional Air Carrier Inspectors had expressed concern about the safety of the company; Airworthiness Inspectors discovered numerous irregularities in the maintenance procedures and record keeping of the company; and ATC personnel issued IFR clearances to company aircraft for off-airways flight during conditions of IFR weather to an airport that was not served by an instrument approach. The Board is concerned that the ineffective identification and reporting of apparent unsafe practices, and/or a lack of coordination between divisions of TC may continue to degrade the effectiveness of routine surveillance, despite the enhanced sophistication of the current surveillance policy."

The Board further recommended that the Department of Transport ensure "there are adequate internal directives to fulfil the objectives of Regional Master Surveillance Plans; and that there is adequate coordination between the Air Navigation and Aviation Regulation directorates to provide effective surveillance (CASB 86-18)."

Following an accident in June 1987 involving an Air Toro de Havilland Beaver (CASB Report 87-H70002), it was found that there was inadequate follow-up by Transport Canada to discrepancies noted by Air Carrier Inspection personnel following the company's base inspections in 1985 and 1986. Consequently, the CASB recommended that "the Department of Transport improve procedures for the follow-up to any outstanding items from the audit of a company's operations (CASB 88-31)."

In September 1987, the CASB forwarded an Aviation Safety Advisory to Transport Canada citing several examples of alleged substandard workmanship by some aircraft repair shops as reported to the Confidential Aviation Safety Reporting Program (CASRP). During CASRP field liaison visits across Canada, several aircraft maintenance engineers (AMEs) raised the subject of poor or improper maintenance practices by some overhaul shops and the need for more monitoring to ensure that standards are maintained. This Advisory called into question the adequacy of Transport Canada's routine surveillance and inspection procedures for overhaul and repair facilities. Because some of the reported irregularities and maintenance work could result in serious airframe or powerplant failures, the Advisory suggested that Transport Canada:

a. invite owners to immediately report examples of inadequate workmanship to regional airworthiness authorities;

b. conduct an independent study to assess the frequency and gravity of the maintenance irregularities as reported to CASRP; and

c. consider strengthening surveillance and inspection requirements for monitoring the adequacy of workmanship by overhaul and repair facilities.

To date, Transport Canada has not replied to this Aviation Safety Advisory.

In summary, the CASB is concerned that Transport Canada's current program for the audit, inspection, and surveillance of operations and maintenance procedures of companies engaged in remote operations is not adequately identifying and resolving potentially dangerous

safety issues. The installation of a non-approved part on the accident aircraft in conjunction with the apparent lack of communication between AMEs, possibly due to inadequate documentation of work completed, and the evidence indicating continued operations above maximum certified gross weights are particularly disconcerting in light of the special attention given by the regulatory authorities to Kenn Borek Air Ltd. since May 1985. Looking beyond this particular accident, the CASB has been concerned for some time about the adequacy of regulatory verification of workmanship in aircraft repair shops. Evidence received by the CASRP strengthens these concerns, as reflected by the CASB's Aviation Safety Advisory of September 1987. The Board recognizes that more regulation is not necessarily required. Rather, the issue is one of maximizing the effectiveness of Transport Canada's regulatory efforts. Therefore the CASB recommends that:

The Department of Transport cause an independent study to be made of Transport Canada's policies and procedures for the audit, inspection, and surveillance of the operations and maintenance functions of air carriers engaged in remote operations.

(CASB 89-05)

The Board is once again concerned that decisions made by two experienced and competent pilots led them to a situation from which recovery was not assured. Neither the option to divert 150 miles at night over mountainous terrain on a single engine nor the option of an immediate single-engine approach in oncoming darkness and marginal weather to an airport in a confined valley were attractive, and it would be difficult to fault a decision either way. Nevertheless, once the decision to land at Ross River had been made, the conditions demanded the utmost in crew coordination to plan the approach and a possible missed approach. All descent and approach planning would have had to be completed before the aircraft descended below the level of the surrounding hills in order to preserve an adequate margin of safety. The CASB will continue to develop its understanding of the human factors which contribute to decision-making and the role of cockpit resource management in arriving at sound decisions.

The Board is concerned that, given the high turnover of pilots in the smaller companies in the current economic climate, the level of pilot knowledge and proficiency on particular aircraft types may be less than desirable. The captain of the accident aircraft had only 90 hours on type, and there is no evidence that he had practised single-engine go-arounds at heavy aircraft weights with the associated limited rates of climb. To have successfully effected a single-engine go-around under the accident circumstances would have required a thorough familiarity with the aircraft's limited single-engine climb and turn performance. Furthermore, pilots may not fully appreciate the decrements in the performance of an aircraft as it ages as opposed to that of a brand-new airframe which was used to derive the data provided by the manufacturer for certification purposes. The Board will continue to monitor the occurrence record for evidence of inadequate pilot familiarity with aircraft performance capabilities and operating procedures.

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JOHNNY MAY'S AIR CHARTER LTD.
DE HAVILLAND DHC-2 MKI BEAVER C-CAZJ
AUPALUK, QUÉBEC
15 NOVEMBER 1987

BRIEF NUMBER: 87-Q70053 (Accident)
LOCAL TIME: 105 EST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,633	1,616
LAST 90 DAYS	286	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The aircraft with three occupants on board was on a cross-country flight from Kuujjuaq to Aupaluk, Québec. On landing, the aircraft touched down on the left main wheel first. When the tail wheel touched down, the aircraft veered to the left, hit two snow-drifts, and came to rest on its nose on the left side of the centre of the runway.

The aircraft was equipped with tundra tires, and the pilot had not operated the aircraft on wheels for some time. Before departure, the pilot checked the weather and runway conditions; on landing there was a cross-wind from the left of approximately 80 degrees at 25 knots, and the runway was covered with some snow-drifts.

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CESSNA 152 C-GORU
STOUFFVILLE, ONTARIO
16 NOVEMBER 1987

REPORT NUMBER: 87-O/70086 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2115 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	185	81
LAST 90 DAYS	21	21

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and passenger departed from Toronto/Buttonville Municipal Airport at 1943 eastern standard time (EST) for a local night flight. The aircraft had been airborne for approximately one and one-half hours when the pilot radioed Buttonville Control Tower for normal arrival and landing instructions. Shortly after initial contact, the pilot reported that the aircraft was out of fuel. He then force-landed the aircraft on a construction site approximately eight miles northeast of Buttonville Airport. On landing, the aircraft nosed over.

The pilot's licence was not endorsed for night flying, although he was approved for solo night training flights.

The aircraft operator's records showed that the aircraft had been refuelled to its capacity of 24.5 usable U.S. gallons and then flown twice earlier in the day for a total of three hours. The pilot reported that, during his pre-flight inspection of the aircraft, the fuel quantity gauges, both left and right, were fluctuating between a three-quarter and full indication. Although the pilot made a visual inspection of the fuel tanks, he did not verify that there was adequate fuel for the intended two-hour local flight.

The Cessna 152 Endurance Profile chart in the performance section of the Pilot's Operating Handbook shows that the aircraft has an average flight endurance of 3.9 hours at 65 per cent power with a 45-minute reserve. Inspection of the aircraft revealed that approximately three-quarters of a gallon of fuel remained in the right wing tank which was situated at the low point of the wreckage. There was no evidence of any pre-impact mechanical or structural deficiencies found in the aircraft.

The aircraft took off with approximately 36 minutes plus a 45-minute reserve of fuel on board. Although the pilot visually inspected the fuel tanks, he did not verify that the amount of fuel indicated on the gauges was correct. Had the pilot checked when the aircraft was last refuelled and how many hours it had flown since, there would have been clear indications that there was insufficient fuel to complete the intended flight safely.

CONCLUSIONS:

Findings:
1. The aircraft engine stopped because of fuel exhaustion.

2. The pilot did not ensure that there was sufficient fuel for the flight.

3. Records were available to calculate the fuel status of the aircraft.

4. The pilot was not endorsed to fly with passengers at night.

5. There were no pre-impact deficiencies found with the aircraft.

Causes:
The pilot did not ensure that there was sufficient fuel for the flight.

AVIATION LES ÎLES INC.
PIPER PA-23-250 AZTEC C-FDMP
MONTRÉAL/DORVAL INTERNATIONAL AIRPORT, QUÉBEC
16 NOVEMBER 1987

REPORT NUMBER: 87-Q70054 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2258 EST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	7,500	1,900
LAST 90 DAYS	260	250

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

In preparation for landing at Montréal/Dorval International Airport, Québec, the gear was selected down, but a gear-unsafe indication was obtained. The aircraft was diverted to Sorel Airport, Québec, where several attempts were made to secure the gear down, using the alternate electric pump and the emergency gear extension hand pump; combinations of G force and yaw were also used, but without success. Finally, the emergency gear extender which employs a CO_2 bottle was used; both main gear indicated safe, but the nose gear failed to lock down. The aircraft then returned to the Dorval airport to land, with the emergency services on standby. Prior to touchdown, the engines were shut down. During the landing roll, the nose gear folded up, and the aircraft settled on its nose, sustaining abrasion damage. Neither occupant was injured. After raising the aircraft's nose, the nose gear was manually extended, and the aircraft was taxied off the runway.

Visual examination of the landing gear retraction system did not reveal any mechanical problem or any cause for the malfunction. Various hydraulic system tests did, however, reveal excessive internal bypass within the hydraulic power pack. This was later traced to a defective main pressure relief valve seal.

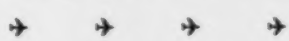
The failure of the emergency gear extender was traced to a disconnected priority valve lock pin; as a result, there was no unrestricted fluid flow return path from the retract side of the gear actuators. In April 1977, Piper issued Service Bulletin 564 calling for the inspection of the emergency gear extender control. Records indicated that this Service Bulletin had been complied with on 28 July 1977. Based on the Piper inspection check-list used by the company, verification of the emergency gear extender rigging is made on a yearly basis by reference to the Service Bulletin, but is not specifically called for. It could not be determined if this system had been tampered with or when it had been left disconnected.

A defective seal caused excessive internal bypass of the main hydraulic pressure relief valve and did not permit the landing gear system to function properly. A disconnected priority valve lock pin did not secure the nose landing gear down following actuation of the emergency system, and, as a result, the nose gear folded up on the landing roll.

CONCLUSIONS:

Findings:
1. A defective seal caused excessive internal bypass of the main hydraulic pressure relief valve and failure of the main landing gear system.
2. Actuation of the landing gear emergency extender failed to secure the nose gear down because a priority valve lock pin was disconnected.

Causes:
A defective seal in the main hydraulic pressure relief valve caused excessive internal bypass, and the landing gear system was not properly installed. A disconnected priority valve lock pin did not secure the nose landing gear following actuation of the emergency lowering system, and the nose gear folded up on the landing roll.



MONCTON FLYING CLUB
PIPER PA-31 NAVAJO C-GVIV
MONCTON, NEW BRUNSWICK
21 NOVEMBER 1987

BRIEF NUMBER: 87-A74122 (Incident)
LOCAL TIME: 1830 AST
OPERATION: Charter
DAMAGE: Minor
PILOT LICENCE: Airline Transport

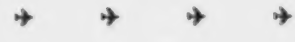
PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	-	-
LAST 90 DAYS	-	-

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

After landing, the aircraft was taxiing across the snow-covered company ramp when the nose landing gear sunk into a recently filled trench, causing both propellers to strike the ground.

The trench had been dug to lay power lines out to the fuel pumps. It had been filled and compacted the day before the occurrence, and the contractor had reported it to be a load-bearing surface.



DIAMOND AVIATION
DE HAVILLAND DHC-3 OTTER N61LC
JOHNNY MOUNTAIN, BRITISH COLUMBIA
22 NOVEMBER 1987

REPORT NUMBER: 87-P70911 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1330 PST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	16,000	130
LAST 90 DAYS	250	130

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was on a visual flight rules (VFR) charter from Wrangell, Alaska to the Skyline Mine landing strip on Johnny Mountain, British Columbia. In preparation for landing, the pilot reduced the aircraft's speed to about 85 mph and extended the wing flaps to approximately 30 degrees. On final approach, the pilot was distracted while observing fresh animal tracks in the snow below, and he inadvertently allowed the aircraft to slow down and descend below the desired flight path. At about 150 feet above the ground, the pilot realized that the aircraft was low and slow, and he applied power and pumped the flap handle in order to raise the flaps. The aircraft did not respond, and it struck the ground 100 feet short of the runway, in about three feet of snow. The landing gear collapsed, and the aircraft was substantially damaged; the pilot was not injured.

The sky was clear, and the wind was from the south at two mph. The snow-covered landing strip was graded, and its north end sloped downward; the pilot landed heading south. No pre-occurrence failures or malfunctions of the aircraft or its systems were reported. During the post-occurrence examination of the aircraft, the pilot noticed that the up/down selector lever for the flaps was in the down position.

The pilot's attention was distracted during the final approach, and he did not notice that the aircraft's angle of descent was getting steeper and that the airspeed was decreasing. When the pilot recognized what was happening, he applied power and pumped the flap handle, thinking that he was raising the flaps; as the flap selector was down, he inadvertently lowered the flaps even more. The increased drag from the lowered flaps prevented the aircraft from recovering, and it struck the ground short of the runway.

CONCLUSIONS:

Findings:
1. The pilot's attention was diverted during the approach.

2. The aircraft's speed and desired glide path were not maintained during the final approach.

3. The flaps were inadvertently lowered instead of raised.

4. The aircraft was substantially damaged.

Causes:
The pilot did not adequately monitor the progress of the aircraft during the final approach, and, when he found the aircraft too low and slow, he applied power and inadvertently lowered the flaps rather than raising them. The resultant increased drag prevented the aircraft from recovering, and it struck the ground short of the runway.

BURRARD AIR LTD.
PIPER PA-31-350 NAVAJO C-GQNC
NANAIMO AIRPORT, BRITISH COLUMBIA
30 NOVEMBER 1987

REPORT NUMBER: 87-P70101 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1939 PST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,400	1,300
LAST 90 DAYS	240	140

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was on a night instrument flight rules (IFR) flight from Comox, British Columbia to Nanaimo, British Columbia. During the descent for a non-directional beacon (NDB) approach, the pilot established contact with the ground while passing through 2,300 feet above sea level (asl); he then proceeded visually for a landing on runway 16. During the landing run, the aircraft con-

tacted a low mound of gravel 2,200 feet from the threshold and 50 feet to the left of the runway. The nose and right main landing gear broke off, the aircraft veered to the right and then slid back onto the runway where it came to rest in an upright position.

The weather at Nanaimo was reported as 600 feet scattered, 1,200 feet scattered, measured 2,500 feet overcast with seven miles visibility in light rain; the wind was from 120 degrees at 11 knots. During the approach, the wind was varying between 090 and 120 degrees magnetic and gusting as high as 26 knots. Moderate turbulence and a wind shear below 600 feet was reported by another pilot who had landed at Nanaimo about 10 minutes before the occurrence. This information was relayed to the pilot via radio from the Nanaimo Flight Service Station.

The 200-foot-wide runway was under construction, and only the east half was in use at the time. The runway centre line, lighted by temporary battery-operated lights, was used as the west edge of the runway. A notice to airmen (NOTAM), stating that only the east half of the runway was usable had been issued at 300140 UTC (29/1740 PST), and a NOTAM regarding the lower intensity of the temporary lights had been issued at 301700 UTC (30/0900 PST). The pilot had landed on runway 16 the previous day; at that time, the west half of the runway was in use, and the runway centre line was the east edge of the usable runway. It was not possible to determine the aircraft's exact point of touchdown; however, main wheel tracks running parallel to the runway in the soft shoulder were found at infrequent intervals between 1,673 to 2,200 feet from the threshold and about 50 feet off the left edge of the runway. Following the breaking of the nose and right main landing gear, the aircraft had swerved to the right onto the runway, 2,473 feet from the threshold.

The pilot was qualified and licensed for the flight. He was familiar with the changing runway condition at Nanaimo, as he had been taking off and landing under the existing conditions for the last 30 days. The pilot reported that he had been informed via radio from the Nanaimo Flight Service Station prior to landing that the eastern half of the runway was in use.

The prevailing winds were gusty and from the left during the approach, but no evidence was found that the aircraft had drifted to the right. The identified wheel tracks, running parallel to and off the left edge of the runway indicated that the aircraft was lined up for landing outside the permanent runway lights, and it touched down somewhere on the left shoulder. It is probable that the pilot had forgotten that the left half of the runway was in use as he had been using one or other half of the runway irregularly for the past 30 days. With the flight visibility impaired by darkness and rain, the pilot may not have seen the less intense temporary lighting along the centre line of the runway. Without this additional cue, he lined the aircraft up where he believed the runway was and touched down outside the permanent edge lights.

CONCLUSIONS:

Findings:

1. Flight visibility was impaired by rain and darkness.

2. Only the left side of the runway was available for landing.

3. The runway centre line, which was the right edge of the active runway, was lighted by less intense, battery-operated lights.

4. The pilot landed on the left shoulder of the runway.

5. The aircraft struck a low mound of gravel during the landing roll, shearing off its nose landing gear and right main landing gear.

Causes:

The pilot landed on the left shoulder of the runway, thinking he was lined up with the runway.

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CESSNA 172M SKYHAWK C-GUGZ
MIDLAND/HURONIA AIRPORT, ONTARIO
05 DECEMBER 1987

BRIEF NUMBER: 87-O/70089 (Accident)
LOCAL TIME: 1900 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	134	119
LAST 90 DAYS	12	12

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was unable to start the engine because the starter would not engage. He applied the parking brake, left the cockpit unattended, chocked the left main wheel, and hand-turned the propeller. The engine started on the

fourth swing; the aircraft hopped over the single chock and rolled until it struck a hangar.

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TERRA AIRCRAFT
ROCKWELL INTERNATIONAL 112 TCA N4648W
GOOSE BAY, NEWFOUNDLAND 35 mi SW
06 DECEMBER 1987

REPORT NUMBER: 87-A70906 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1918 AST
OPERATION: International Contract
DAMAGE: Destroyed
PILOT LICENCE: Senior Commercial (Federal Republic of Germany)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,100	30
LAST 90 DAYS	60	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	1	-

SUMMARY REPORT:

The aircraft was on an instrument flight rules flight from Bangor, Maine to Goose Bay, Newfoundland. At about 50 miles southwest of Goose Bay, the aircraft encountered extreme turbulence with violent updrafts and downdrafts and began to climb and descend uncontrollably at vertical speeds in excess of 2,000 feet per minute. The aircraft then entered a downdraft and crashed into the side of a tree-covered hill at an elevation of 1,600 feet above sea level (asl). A Search and Rescue aircraft located the accident site without difficulty as the pilot had activated the emergency locator transmitter (ELT), and the two seriously injured occupants were rescued the following morning.

The pilot had estimated that the flight would take five hours, and the aircraft had sufficient fuel for about 8 hours and 30 minutes. Stronger than forecast head winds were encountered, and, after 6 hours and 30 minutes, the aircraft was still about 50 miles southwest of Goose Bay. Although at that time the fuel flow meter indicated that there were 120 pounds of fuel remaining, sufficient for about two hours further flight, the fuel gauges indicated that the tanks were nearly empty, and the pilot became concerned about his fuel status. For this reason, he requested from Goose Bay Terminal a direct routing to the airport and was cleared down to 3,000 feet.

It was not possible to determine how much fuel was in the tanks when the aircraft crashed, as the aircraft came to rest in an inverted attitude; however, there was evidence of fuel having spilled out of the tanks after impact, and there was no reason to doubt the accuracy of the fuel flow meter. An examination of the engine indicated that it was running at the time of impact.

When the pilot checked the weather in Bangor, the area forecast for the Goose Bay area was not available because of a computer problem. The terminal forecast was available, and it forecast ceilings variable to 700 feet obscured, visibility restricted to two miles in snow showers, and surface winds gusting to 50 knots. The area forecast valid for the Goose Bay area at the time of the crash warned of moderate to severe turbulence below 5,000 feet asl due to strong surface winds. A significant meteorological report (SIGMET) had also been issued with a similar warning of severe turbulence. The pilot did not obtain updated weather information during the flight and was not aware of the forecast severe low-level turbulence. Moncton Centre did not pass SIGMET information to the pilot; the aircraft would normally have remained at the cruising altitude of 11,000 feet asl during the flight portion under Moncton control.

The pilot declared his concern about low fuel to Moncton and was given initial descent to 5,000 feet asl. He was soon handed off to Goose Bay Military Control where he immediately stated his fuel concern and requested direct routing over the airfield. He was given and he accepted further descent to 3,000 feet asl. The Goose Bay controller did not consider passing SIGMET information to the pilot because in effect the pilot had already declared concern over a more serious issue – the possibility of running out of fuel.

Although the pilot expressed concern about his fuel status, the evidence indicated that the engine was running at impact and that there was significant fuel for the aircraft to reach Goose Bay Airport.

Because of the severity of the downdraft encountered, the pilot was unable to control the aircraft, and it crashed into the hillside.

CONCLUSIONS:

Findings:

1. The pilot did not obtain updated weather information during the flight and was not aware of the forecast severe low-level turbulence.

2. Air Traffic Control did not provide the pilot with available SIGMET information indicating severe low-level turbulence.

3. A violent downdraft caused the aircraft to descend and strike the ground.

Causes:
The Canadian Aviation Safety Board determined that a severe downdraft caused the pilot to lose control of the aircraft.

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AIR NEW-BEC INC.
PIPER PA-23-250 AZTEC C-GMVT
BATHURST, NEW BRUNSWICK 7 mi S
14 DECEMBER 1987

REPORT NUMBER: 87-A70036 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2214 AST
OPERATION: Charter
DAMAGE: Destroyed
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6,500	N/A
LAST 90 DAYS	110	67

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	1	-	-

HISTORY OF THE FLIGHT:

The aircraft departed Moncton, New Brunswick at 2130 Atlantic standard time (AST) on a visual flight rules flight to Bathurst. This was the final leg of a courier flight which had departed Bathurst at 1840 AST with stops in Chatham and Fredericton. At 2214 AST, an over-flight picked up an emergency locator transmitter (ELT) signal. After it was determined that C-GMVT had not landed in Bathurst, a search was commenced by Search and Rescue (SAR). The ELT signal was also picked up by the SAR satellite, and, although the ELT signal remained strong, the location could not be fixed by SAR during the hours of darkness. At first light, SAR aircraft located the crash site in a wooded area seven miles south of the Bathurst Airport. The aircraft had descended into the trees, in an upright, wings-level attitude, with the nose slightly down. It left a trail of wreckage through the trees and struck the ground in an inverted attitude, killing the pilot and the passenger.

PERTINENT INFORMATION:

The accident occurred on a dark, moonless night. The sky was clear with 15 miles visibility, the temperature was minus 15 degrees Celsius, the dew point minus 11 degrees Celsius, the wind was 250 degrees true at five knots, and the altimeter setting was 30.09.

Autopsies were conducted on both the pilot and the passenger. There was no evidence that incapacitation or physiological problems affected the pilot's performance. Neither the pilot nor the passenger was wearing the available shoulder harnesses. The passenger, a friend of the pilot, did not have any aviation experience.

The location of the crash site corresponds with the aircraft being established on left base for runway 28 at Bathurst. The terrain in the Bathurst area is generally level. The airport is 193 feet above sea level (asl), while the elevation in the area of the crash site is 200 to 250 feet asl. The terrain is swampy and overgrown with trees, and, although close to the town, there are no lights in the area.

The aircraft descended gradually into the trees, while in a wings-level, five-degree nose-down attitude, flying at or above the normal cruising speed. The landing gear was retracted, and the flaps were up. The altimeter was set at 30.04.

The initial tree strike was near the top of a six-inch-diameter poplar tree, 50 feet above ground level (agl). The nose of the fuselage started to break up immediately, and the aircraft started to roll over. As it travelled through the trees, the wings, outboard of the engine nacelles, and the vertical stabilizer were torn off and destroyed. These components were strewn along the 580-foot wreckage trail. The horizontal stabilizers and elevators were extensively damaged.

All the aircraft components were found at the crash site, and there was no evidence of any pre-impact structural failure.

The fuel cells were full when the aircraft departed Bathurst. With full fuel, the aircraft contained 820 pounds of usable fuel, which gave an endurance at cruise power of about 4 hours and 30 minutes. At the time of the crash, the aircraft had flown 2 hours and 18 minutes since the fuel tanks were filled. The fuel cells were ruptured during the crash, and it was not possible to confirm the amount of fuel they contained prior to impact; however, based on the time flown since refuelling, there was ample fuel for the flight.

The autopilot control unit was recovered; however, the autopilot master control switch was not found. The elevator trim wheel controller on the autopilot unit was found in a position which indicated a command for a nose-down attitude.

The left engine remained with the fuselage; however, the propeller had broken off. The right engine and propeller separated from the wing and were found 50 feet short of the main wreckage. The engines were operating normally at impact. There was no evidence of a pre-impact mechanical malfunction.

The aircraft had two very high frequency (VHF) radios. One was selected to the Moncton ground control frequency, and the other to the Bathurst UNICOM frequency. The last transmission heard from the aircraft was on departure from Moncton. Company procedures required crews to close their flight plans with Charlo radio when approaching Bathurst; this was not done. The company dispatcher was monitoring the Bathurst UNICOM frequency on a scanner, and no transmissions were heard, nor were any recorded on the air traffic services tape at Canadian Forces Base Chatham.

The position of the instrument panel light rheostat shows the panel lights were turned up to bright, and the pilot's overhead map light was on. The co-pilot's overhead light was also on. The pilot had a preference to operate at night with the instrument lights turned up to bright. He had completed the aircraft journey log book entries for the trip, including those which would normally have been made after landing in Bathurst. The journey log book was found wedged between the pilot's knees.

ANALYSIS:

The CASB Engineering Laboratory examination of the autopilot control unit failed to determine whether the autopilot was engaged and/or operating at the time of the accident. The nose-down attitude command selection could have been the result of crash forces, hence not representative of a pre-crash selection.

The investigation considered the possibility that the pilot fell asleep. However, because of the relatively short flight legs and with a passenger to talk to, the chance of this occurring was considered unlikely.

The aircraft was in a normal cruise configuration at impact, suggesting the pilot did not know that the aircraft was about to strike the ground. For the pilot not to know he was dangerously close to the ground and descending, he must have been distracted or preoccupied with activities which took his attention away from monitoring the aircraft flight and instruments.

The investigation indicates that the aircraft was functioning normally at impact; however, there is evidence that the pilot was preoccupied with completing the log book. The area of the crash site was very dark and void of any lights on the ground. With the aircraft instrument lights turned up to bright and the map lights on, visual reference with the ground would be difficult.

It is essential that a pilot pay attention to the primary role of flying the aircraft, particularly while descending and joining the circuit. With the good weather conditions and with the completion of the trip in sight, the pilot may not have been as alert as he might otherwise have been. As contact with the trees was sudden and unexpected, it is evident that the pilot was preoccupied and not paying attention to flying the aircraft.

CONCLUSIONS:

Findings:

1. The aircraft had sufficient fuel to complete the flight, and both engines were running at impact.

2. There were no known aircraft unserviceabilities.

3. It could not be determined whether the aircraft was on autopilot.

4. There was no emergency message transmitted.

5. The aircraft contacted the trees while in a gradual descent, at or near the normal cruise speed.

6. The aircraft instrument panel lights were turned up to bright, and the pilot's and co-pilot's overhead map lights were probably on.

7. During the descent, the pilot was preoccupied, probably with completing the journey log book, and was not aware that the aircraft was descending into the trees.

8. Journey log book entries for the final leg had been completed, and the log book was found wedged between the pilot's legs.

Causes:

The pilot was not paying attention to his primary role of flying the aircraft.

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LA RONGE AVIATION SERVICES LTD.
DHC-2 BEAVER C-GMAQ
LA RONGE, SASKATCHEWAN
19 DECEMBER 1987

BRIEF NUMBER: 87-C70095 (Accident)
LOCAL TIME: 1500 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,500	600
LAST 90 DAYS	250	35

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The pilot landed the ski-equipped aircraft on the frozen lake and taxied to the parking area. He attempted to park the aircraft on poles for the night; however, because of wind and ice conditions, he was not successful. The pilot increased the power to taxi around and reposition the aircraft on the poles. Because of a 15-knot wind, the pilot was unable to properly control the aircraft, and it slid sideways and struck a dock with the right main ski. The impact caused the ski to bend and the right axle to shear, allowing the propeller to strike the dock.

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AERONCA 11AC CHIEF C-FVYB
LAMONT, ALBERTA 7 mi N
16 DECEMBER 1987 (DATE REPORTED)

REPORT NUMBER: 87-W70087 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: N/A
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: N/A

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	N/A	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	N/A
PASSENGERS	-	-	-

SUMMARY REPORT:

The owner of the recently purchased aircraft had arranged for a familiarization flight with the previous owner. When the previous owner arrived at the farm strip, he removed the tarpaulin from the aircraft and discovered that the aircraft had sustained substantial damage. Several days later, the owner reported that the aircraft had been stolen and damaged. It was determined that the aircraft had been overturned as evidenced by the damage to the upper wing surfaces and rudder. Propeller damage indicated the engine had been operating at the time of the occurrence.

A snow storm had obliterated any evidence of ground marks. The extensively damaged aircraft had been returned to its storage area, tied down, and propped up with tree limbs. Because of the damage to the right landing gear and right wing, the efforts of several persons would have been required to move the wreckage.

The local RCMP conducted a criminal investigation into the matter but were unable to determine who was responsible for damaging the aircraft. The cause of this accident could not be determined.

CONCLUSIONS:

Findings:
1. The owner reported that the aircraft was stolen and damaged.

Causes:
The cause of this accident could not be determined.

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CESSNA 185F SKYWAGON C-GUGM
LAC TIBÉRIADE, QUÉBEC
29 DECEMBER 1987

BRIEF NUMBER: 87-Q70058 (Accident)
LOCAL TIME: 1330 EST
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	8,050	1,500
LAST 90 DAYS	60	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

After checking the thickness of the ice on the edge of the lake, the pilot manoeuvred the ski-equipped aircraft on the surface he had checked, intending to take off to the north. The wind, which was from the northwest at about 20 knots, prevented the aircraft from following the planned path and pulled it toward the centre of the lake, where the thickness of the ice had not been checked. When the pilot made a turn to the left to take off, the right ski sank into the ice, and the aircraft, with the engine at full power, came to rest in the icy water. The pilot and the passenger exited uninjured. The aircraft sustained damage due mainly to the immersion.

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V. KELNER AIRWAYS LIMITED
CESSNA A185F SKYWAGON C-GGRJ
PICKLE LAKE, ONTARIO
03 JANUARY 1988

BRIEF NUMBER: 88-C0002 (Accident)
LOCAL TIME: 1240 CST
OPERATION: Commercial Non-Revenue
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	298	74
LAST 90 DAYS	69	68

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The ski-equipped aircraft was returning empty to the ice base at Pickle Lake. The landing was in a light, right cross-wind, and the touchdown was smooth. During the landing run as the pilot reduced power, the aircraft dropped to the right, the nose dropped, and the aircraft swung to the right. The propeller contacted the ice. The right landing gear leg had failed in the axle attachment area.

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PROPAIR INC.
DE HAVILLAND DHC-2 BEAVER C-FTEB
LAC ATWATER, QUÉBEC
08 JANUARY 88

REPORT NUMBER: 88-Q0009 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1400 EST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,458	1,100
LAST 90 DAYS	65	57

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

HISTORY OF THE FLIGHT:

The ski-equipped Beaver was on a charter, carrying three government biologists who were conducting a census of the local moose population. To facilitate the census, the aircraft was flown at 300 feet above ground level (agl) along a precise navigation grid. After 35 minutes of cruise flight, the engine (Pratt & Whitney R985) abruptly lost power. During a steep right turn toward a frozen lake, the aircraft contacted trees and crashed approximately 1,400 feet short of the lake. The four occupants escaped injury, but the aircraft was substantially damaged.

PERTINENT INFORMATION:

There was an unlimited ceiling and visibility at the time of the accident, with a wind of approximately six knots from the southeast. The temperature was minus 10 degrees Celsius.

The pilot was certified and qualified for this type of flight and was familiar with the demands of census-taking. This was the third day of operations and the sixth flight undertaken by the pilot, his second flight of the day.

The pilot and all three passengers were unanimous in describing the occurrence "as if the pilot had cut the gas." There were no backfirings or indications of the engine running rough prior to the loss of power. Although the engine stopped delivering power, the propeller continued to windmill. The pilot did not attempt to restart the engine beyond changing the fuel selections.

The aircraft was one of three Beavers taking part in the census. All three aircraft were serviced at the same time, using the same source for fuel and oil. None of the other pilots reported any irregularities in engine performance, although all were in the same area at the same altitude and using similar power settings. The accident aircraft had had some electrical generation problems and an attempt was made to rectify them the night before. Trouble-shooting revealed the source of electrical difficulty to be a failed cannon plug on the generator of the aircraft. The parts were ordered, and the pilot opted to fly while awaiting their delivery. After take-off, the pilot therefore turned all electrics off. Once the engine is started, turning the electrics off does not affect engine operation. This procedure was used for both flights on 08 January 1988.

The aircraft was fuelled after the morning flight, both the front and centre tanks were filled to capacity while the aft tank was left empty. The take-off was made using the centre tank, which contained enough fuel for the take-off and approximately 90 minutes of flight at cruise consumption. The fuel tanks did not rupture during the crash. The forward tank was found full and the centre tank, slightly more than half full. The fuel lines between the centre tank sump and the carburettor were found to contain fuel, as did the carburettor. The fuel selector switch was found in the centre tank position, and the electrical master switch was found in the OFF position.

At the moment of power loss, the aircraft had just passed to the south of a small frozen lake. Directly ahead of the aircraft was slightly rising terrain with a sparse birch tree cover. The pilot decided to attempt to turn and land on the small lake rather than accept a forced landing straight ahead. To do so, he began a steep right turn, during which the aircraft contacted the trees. At initial tree contact, approximately 80 feet agl, roughly 60 degrees of the required 150-degree turn had been accomplished.

During the impact, both wings broke at their roots, the engine mounts broke allowing the engine to tear free, the lower firewall buckled imprisoning the feet of both front-seat occupants, the aircraft yawed almost 90 degrees, and an 18-inch diameter tree completely penetrated the passenger area coming to rest against their seat-backs. It took approximately 20 minutes for the occupants to extricate themselves from the wreckage.

The engine was the subject of a detailed analysis, which revealed that the engine was in functioning condition upon impact. The components of the ignition system were examined and found to be working. The throttle linkage between the carburettor and the firewall came under close scrutiny, as the linkage did not break in the same manner as the mixture linkage, despite its proximity and similarity of construction. The throttle arm did not break where it was threaded but, instead, the hinge bolt at the firewall end was found to be missing, with no apparent smearing or gouging of the remaining linkage surfaces as one would expect if the bolt had been torn out. The throttle arm was twisted and bent, and the throttle mechanical stop was broken.

ANALYSIS:

Without a serviceable electrical generation system, the aircraft was technically not airworthy.

The condition of the engine, combined with the presence of fuel throughout the system and a functioning ignition system, do not explain the abrupt loss of engine power. It is possible that the throttle linkage came undone in flight; however, the damage, both to the linkage and to the throttle mechanical stop, is inconsistent with this theory.

Safe-flying practices dictate that, when operating at very low level with little margin of safety, the pilot's response to any critical emergency should be planned. With an engine failure at low level, the generally accepted procedure is to force-land ahead, at as slow a speed as possible and under full control of the aircraft. A steep turn at low altitude and with the engine out is not considered a safe practice. Considering the amount of aircraft damage, the occupants were indeed fortunate to escape uninjured.

CONCLUSIONS:

Findings:

1. The engine lost power.

2. The pilot elected to turn at low altitude after the loss of engine power, increasing the risk to his passengers and himself.

3. The aerial moose census involves prolonged operations at low altitude, often over inhospitable terrain.

4. The aircraft was being operated while it was not airworthy.

Causes:

The Canadian Aviation Safety Board could not determine the cause of the loss of engine power.

AQUILA AIR LTD.
PIPER PA-23-250 AZTEC C-FJAI
NANAIMO, BRITISH COLUMBIA 10 mi E
11 JANUARY 1988

REPORT NUMBER: 88-P0003 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1140 PST
OPERATION: Non-Regular Specific Point
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	725	115
LAST 90 DAYS	250	100

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The aircraft had taken off from Nanaimo, British Columbia and was in normal cruise at 1,000 feet above sea level (asl) en route to Vancouver, British Columbia, when a sea-gull hit and shattered the top left corner of the right windscreen and penetrated the cabin. Both passengers, sitting on the right side of the aircraft, were struck by small pieces of plexiglas and sea-gull but were not seriously injured. The pilot slowed the aircraft and returned for landing at Nanaimo.

At the time of the bird strike, the aircraft was overflying islands in the Gulf of Georgia, and the landing lights were off. The weather was overcast with a ceiling of 5,000 feet asl and a visibility of more than 10 miles. Company policy is to operate without landing lights except in congested areas or near airports.

The Aeronautical Information Publication (AIP) Canada states that "birds seem to see aircraft showing lights in time to take avoiding action." Since the aircraft was being operated in an area where bird activity can be expected, a company policy of "landing lights on" may have prevented this bird strike.

CONCLUSIONS:

Findings:
1. A sea-gull hit and passed through the aircraft's windshield.

2. The aircraft was operating in an area where bird activity could be expected.

3. The aircraft was operating without landing lights.

Causes:
The aircraft experienced a bird strike.

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NORTH YUKON AIR LTD.
CESSNA 207 SKYWAGON C-GEBZ
EAGLE PLAINS, YUKON
14 JANUARY 1988

BRIEF NUMBER: 88-W00[illegible] (Accident)
LOCAL TIME: 1145 PST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,000	200
LAST 90 DAYS	200	200

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The aircraft was left parked for four days at the Eagle Plains Airport with low fuel in both tanks. During this time, the temperature varied from –20 to –45 degrees Celsius. In preparation for a trip to Old Crow, Yukon, the pilot had the fuel tanks filled and the aircraft preheated. Seconds after take-off, the engine (Continental IO-520) lost all power, and the pilot made a forced landing into soft snow past the end of the runway. The pilot reported that the fuel screen was found to be clogged with ice crystals.

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NORTHLANDS AIR MANITOBA LTD.
CURTISS WRIGHT C-46F COMMANDO C-GTPO
THOMPSON, MANITOBA
15 JANUARY 1988

BRIEF NUMBER: 88-C0015 (Incident)
LOCAL TIME: 1245 CST
OPERATION: Charter
DAMAGE: Minor
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6,000	700
LAST 90 DAYS	195	175

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIPCUMSTANCES:

The C-46F aircraft had started to taxi for take-off when it struck a parked Islander aircraft with its left wing and horizontal stabilizer. The Islander suffered substantial damage to its vertical stabilizer. The C-46F has a high nose-up attitude when on the ground.

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SUPAIR AVIATION INC.
PIPER PA-34 SENECA C-GDET
RIVIÈRE-DU-LOUP, QUÉBEC
19 JANUARY 1988

REPORT NUMBER: 88-Q0014 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1815 EST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	15,500	230
LAST 90 DAYS	200	100

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

SUMMARY REPORT:

The pilot of a charter flight was preparing for a night landing on the runway at the Rivière-du-Loup Airport. On touchdown, the pilot lost all reference with the runway lights when the aircraft was between two snowbanks. The left wing struck a snowbank, and the aircraft veered to the left and swung three-quarters of a turn. The aircraft rolled backwards and came to a stop on the left side of the runway.

On the morning of the incident, the pilot had called the Rivière-du-Loup Airport about the condition of the runway. He was informed that a crew was in the process of clearing the runway. The pilot advised that his estimated time of arrival at the Rivière-du-Loup Airport was 1700 eastern standard time (EST) and that he would call back later to obtain further information about the runway. The pilot inquired about the weather prior to flight time but did not obtain any runway information.

The snow had been partially cleared from a 100-foot-wide strip of the runway. At the time of the accident, there was a snowbank about three feet high between the centre line and the runway lights on both sides of the runway.

No report on the condition of the runway was sent to Québec air traffic control (ATC). No Notices to Airmen (NOTAM) were issued by the person in charge of the airport, concerning the snowbanks on the runway, contrary to the provisions of the Transport Canada manual on snow removal and de-icing of runways. Under a Transport Canada contract with the City of Rivière-du-Loup, two crews were assigned to runway snow removal. One crew would clear the runway and leave a snowbank on each side of the centre line, and the other would subsequently remove the snow with a snowblower belonging to the city. In this case, the snowblower crew did not finish their work until five days after the accident.

The city cleared part of the runway and left a snowbank on each side of the runway centre line, but these snowbanks were not removed immediately by the snowblower crew. The person in charge at the airport did not issue a verbal notice or a NOTAM through Québec ATC to advise pilots of the condition of the runway.

The pilot did not obtain information about the condition of the Rivière-du-Loup runway immediately prior to the flight. It was dark, and the runway lights were not visible because they were hidden by the snowbanks. The pilot lost all reference with the runway on touchdown, and the aircraft veered to the left. The left wing struck the snowbank.

CONCLUSIONS:

Findings:
1. No NOTAM was issued by the person in charge at the airport to notify pilots of the condition of the runway.

2. The pilot did not obtain information about the condition of the runway immediately prior to the flight.

3. The pilot lost all reference with the runway because he was between the two snowbanks that obscured the runway lights.

4. The aircraft veered to the left, struck the snowbank on the left side of the runway, and rolled backwards to a stop.

Causes:
On touchdown, the pilot had no ground reference because he lost visual contact with the runway lights which were hidden by snowbanks on both sides of the runway.

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CESSNA 172P SKYHAWK C-GTMO
THETIS ISLAND, BRITISH COLUMBIA 1 mi E
24 JANUARY 1988

REPORT NUMBER: 88-P0010 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1514 PST
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	97	19
LAST 90 DAYS	5	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	3	-	-

HISTORY OF THE FLIGHT:

The pilot and three other cadets from the Royal Roads Military College in Victoria, British Columbia had rented a Cessna 172 aircraft for a sightseeing trip in the Vancouver/Gulf Islands area. They took off from the Victoria Airport at 1421 Pacific Standard time (PST), in visual flight rules (VFR) conditions, and were expected back by 1630 PST. When the aircraft was overdue, a search was initiated. The aircraft was found five days later in 135 feet of water, 1.5 miles east of Pilkey Point on Thetis Island. There were no survivors.

PERTINENT INFORMATION:

The Vancouver Air Traffic Control Radar recorded the flight path of the aircraft after it took off from the Victoria Airport. The aircraft proceeded in a northerly direction, while climbing to 1,500 feet above sea level (asl); crossed the Strait of Georgia between Active Pass and Point Roberts; circumnavigated the city of Vancouver and environs in a counterclockwise direction; and proceeded back across the Strait of Georgia between Point Grey and Thetis Island. The aircraft manoeuvred in this area for some time, then, at 1514:08 PST, radar contact was lost. It was determined during the search that, in the vicinity of the crash site, radar contact with a search aircraft was lost when the aircraft descended below 500 feet asl. Radio transmissions between the pilot and Victoria and Vancouver Air Traffic Controllers were normal, with the pilot indicating that he was on a sightseeing tour around Vancouver.

The weather throughout the area was suitable for VFR flight. Victoria reported a broken ceiling at 12,000 feet with 30 miles visibility; Vancouver reported a broken ceiling at 8,000 feet with 20 miles visibility; and Nanaimo, within 10 miles to the west of the occurrence site, reported a broken ceiling at 11,000 feet with 15 miles visibility. There was no precipitation reported; surface temperatures were four and six degrees Celsius and dew points were zero to three degrees Celsius; the freezing level was around 4,000 feet asl. Occasional dew point depressions to two Celsius degrees or less might have caused some carburettor ice, and occasional moderate turbulence might have been encountered off the east side of Vancouver Island.

The aircraft had dual controls and was certified and maintained in accordance with the existing regulations and approved procedures. Its all-up weight and centre of gravity were within the prescribed limits. It departed Victoria, British Columbia with about 30 gallons of fuel, sufficient for more than three hours of flying. Although life-jackets were readily available from the operator and Air Navigation Order (ANO) II, No. 8 requires one life-jacket for each person on board a single-engined aircraft when operating beyond gliding distance from shore, the pilot did not place any on board the aircraft before departure.

The aircraft was raised from the sea bottom and examined. Although heavily damaged the aircraft had remained intact. The leading edge of the wing sustained compression damage from tip to tip, and the instrument panel, fire wall and engine, remained attached to the aircraft only by control cables. The flaps were in the up position. The carburettor heat control was found in the cold position.

No fuel remained in the aircraft at the time of its examination. However, it was apparent from the strong smell that there was fuel mixed with the sea water that drained from the aircraft immediately after it was recovered, and deformation of the right wing tank forward wall sug-

gests that there was fuel in the tank when the aircraft struck the water.

Disassembly of the engine did not reveal any pre-impact failure or malfunction that would have contributed to a power loss. One blade of the propeller was bent slightly forward at the tip and the other slightly backward. Damage to the propeller was consistent with low power being developed at impact.

The occupants remained in their respective seats, and were recovered with the aircraft. Both the rear passenger seat-belts had failed. The left one had pulled out the section of the fuselage to which it was attached, and the right one tore close to the wall attachment fitting. The two forward seat-belts were still secured to their floor attachments.

The rear seat became detached from the floor during the impact, and its legs then penetrated the floor. The seat's forward legs failed at the weld where the foot is attached, and the rear legs pulled their attachment bolts out of the floor. The front seats also became detached during impact but this was due to the deformation of the floor and seat tracks.

The failed rear seat belts and the failed frames of the rear seat were sent to the Canadian Aviation Safety Engineering Laboratory for examination. It was determined that no material or manufacturing deficiencies contributed to the failures. The calculated impact load of more than 22.5 G had exceeded the design criteria of the materials involved and all fracture surfaces examined were consistent with an overload mode of failure.

There was no evidence found of any airframe failure or system malfunction prior to or during the flight.

The pilot was licensed and qualified, and he was generally familiar with the area of this flight. According to his records he had accumulated a total of 96.5 hours of flying time, and he had last flown on the 24 October 1987. As an air cadet, he had qualified for his glider pilot licence in August 1983. In August 1984, he had successfully completed his private pilot training with Juan Air (1979) Ltd. in Victoria, British Columbia, and, in August 1987, he had passed the military's primary flying course at the Canadian Forces Base in Portage, Manitoba. He had been exposed to flying at an early age and was regarded as a cautious and safety-oriented pilot.

The pilot did not file a flight plan, nor did he share with any responsible person the exact itinerary of his flight, even though his intended flight was more than 25 nautical miles from the airport of departure. He had mentioned, however, that he would like to see, from the air, an area on the west side of Thetis Island where he had visited approximately 30 days before the occurrence.

The pilot, secured by the lap belt, was occupying the left front seat. His injuries were consistent with that location during sudden deceleration, and a chest abrasion (left to right) was compatible with a diagonal shoulder strap injury, even though the shoulder harness connecting link was found disconnected at the time of recovery.

Pathological and toxicological examinations determined that injuries sustained during the initial impact resulted in loss of consciousness by all the occupants and that death occurred as a consequence of drowning. There was no evidence that incapacitation, physiological, or psychological factors had affected the pilot's performance. The accident occurred unobserved in an area where rescue would have depended on the fortuitous presence of a boat.

The emergency locator transmitter (ELT) (Donne & Margolin) was sent to the Canadian Aviation Safety Engineering Laboratory for examination. It was determined that both the antenna connector pin and the positive battery wire had failed in overload because of impact forces, thus preventing its operation.

ANALYSIS:

The condition of the wreckage, in particular the compression deformation of the leading edge of the wing, indicates that the aircraft struck the water in a steep (approximately 55 degrees), nose-down, wings-level attitude, at fairly low speed, as would occur if the aircraft stalled at low altitude.

The cloud and visibility conditions were favourable at the time of the accident and were not considered a factor. Although moderate turbulence was mentioned in the aftercast, weather reports from Nanaimo, 10 miles away, did not mention any turbulence. The weather conditions were, however, conducive to carburettor icing, but it was not possible to determine from the examination of the wreckage if it was a factor in the accident. Although the carburettor heat control was found in the cold position, this is not necessarily indicative of its position prior to impact because of the extensive deformation of the nose section. In any event, a loss of power for any reason should not normally have resulted in a loss of control or stall.

The radar plot of the flight indicates that the aircraft had been manoeuvring over the water in the vicinity of the accident site before the radar target was lost, either because the aircraft had descended below 500 feet asl or because it had crashed. As there were no witnesses to the event, it was not possible to determine why the pilot was manoeuvring in the area nor the circumstances leading up to the stall.

The occupants drowned because they were rendered unconscious on impact; therefore, the fact there were no life-jackets in the aircraft did not affect the outcome of this accident.

CONCLUSIONS:

Findings:

1. Control of the aircraft was lost at low altitude and it stalled.

2. The aircraft struck the water in a steep, nose-down and wing level attitude, then sank.

3. The pilot did not file a flight plan or inform any responsible person of the exact itinerary of his flight.

4. The pilot did not ensure that the required life-jackets were on board the aircraft.

Causes:

For reasons which could not be determined control of the aircraft was lost at low altitude and it stalled, striking the water in a steep nose-down attitude.

SABOURIN LAKE AIRWAYS
CESSNA A185F SKYWAGON C-GLJC
RED LAKE, ONTARIO
25 JANUARY 1988

BRIEF NUMBER: 88-C0020 (Accident)
LOCAL TIME: 1320 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	890	7
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot taxied to the threshold of the runway and applied power for take-off. The aircraft had rolled a short distance forward when the pilot's seat slid rearward; he was unable to maintain directional control, and the aircraft ground looped. The aircraft slid sideways off the runway into deep snow.

Compliance with Airworthiness Directive CF 87-15 had been accomplished prior to the occurrence; the reason for the aft movement of the seat was not determined.

RISK OF COLLISION BETWEEN:
BRITISH AEROSPACE 3112 JETSTREAM 31
C-FAMJ and PIPER SEMINOLE PA-44 C-GBNU
HAMILTON AIRPORT, ONTARIO
30 JANUARY 1988

REPORT NUMBER: 88-O/0036
LOCAL TIME: 1101 EST
INFORMATION SOURCE: Field Investigation

BRITISH AEROSPACE 3112 JETSTREAM 31 C-FAMJ

OPERATOR: Ontario Express Ltd.
OPERATION: Private Training
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	4,630	535	2,355	554
LAST 90 DAYS	168	168	240	240

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	4
PASSENGERS	-	-	-

PIPER SEMINOLE PA-44 C-GBNU

OPERATION: Flying Club Training
DAMAGE: None
PILOT LICENCE: Senior Commercial

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	1,314	87	324	20
LAST 90 DAYS	105	18	11	11

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The crew of a Jetstream 31 aircraft was conducting an instrument flight rules (IFR) training flight from Hamilton, Ontario to Toronto, Ontario. Their departure clear-

ance was to depart runway 30 Right, turn right direct to the Ash very high frequency omnidirectional range (VOR), 10 nautical miles north of airport, and climb to and maintain 4,000 feet. The Hamilton Tower Controller instructed the Jetstream pilot to stay on tower frequency after take-off and, shortly after take-off, instructed him to turn right and contact Toronto Centre. As the Jetstream aircraft climbed through 3,000 feet, the crew were surprised when they saw a Piper Seminole aircraft manoeuvring to avoid them. The Jetstream crew took evasive action and reported the near miss to Toronto Area Control Centre.

PERTINENT INFORMATION:

Notice to Airmen (NOTAM) Number 88-011 issued to Hamilton Tower, regarding noise abatement procedures to be followd by turbo-prop aircraft departing Hamilton, was in effect and called for aircraft to climb on runway heading to 3,000 feet before proceeding on course.

The controller had been on duty for four hours prior to the incident. After a short break, he assumed responsibility for the airport position at 1048 eastern standard time (EST), 13 minutes before the occurrence.

The traffic volume at the time was moderate to heavy and was considered to be fairly complex. The weather was reported to be visual meteorological conditions (VMC), with 10 miles visibility.

The controller instructed the Jetstream to turn right shortly after take-off because a Cessna 172 was holding at 3,000 feet at the Alpha beacon, located 3.7 nautical miles from the airport on the departure path of runway 30 Right, and there was a potential for conflict between the two aircraft.

Two minutes prior to issuing the take-off clearance to the Jetstream, the controller had cleared a Piper Seminole aircraft, which was operating on visual flight rules (VFR), to proceed from the Ash VOR 10 nautical miles northwest of the airport to the Hamilton non-directional beacon (NDB), 4.5 nautical miles southwest of the airport, and to maintain 3,000 feet; this track crossed the departure path of runway 30 Right from north to south, about four miles west of the airport, close to the Alpha beacon.

The controller was about to inform the Cessna pilot of the Seminole traffic when the Cessna pilot requested and was cleared for an approach and was then no longer in conflict with the Seminole.

While the Piper Seminole aircraft was proceeding from the Ash VOR to the Hamilton NDB, the Jetstream took off and came into conflict with the Seminole. The controller informed the Seminole pilot of the Cessna traffic at the Alpha beacon, but he had not informed the Jetstream and Seminole pilots of each other's position. The Seminole pilot (VFR) was the first to notice the convergence and took immediate action to avoid collision by executing a 45-degree bank turn to the right, away from the approaching Jetstream. The Seminole pilot estimated the minimum distance between aircraft to be 500 feet. The Jetstream pilot saw only the belly of the Seminole before he took evasive action by turning right, and he estimated the minimum distance to be approximately 100 to 200 feet.

ANALYSIS:

The coordination of IFR and VFR aircraft significantly increased the controller's workload, which may have affected his performance. In his attempt to accommodate the requests of the traffic under his control, the controller chose to deviate from a published noise abatement NOTAM in order to maintain separation between the departing Jetstream 31 aircraft and the Cessna holding at the Alfa beacon. The controller did not consider the Seminole aircraft as being in conflict with the departing Jetstream 31 aircraft.

Both crews did not notice one another until very late in the convergence, suggesting that the effectiveness of their look-out procedures was less than satisfactory.

CONCLUSIONS:

Findings:

1. The controller had a heavy workload at the time of the occurrence.

2. The controller issued take-off instructions to the Jetstream aircraft contrary to a published noise abatement NOTAM.

3. The controller did not consider that the Jetstream and the Seminole would conflict with each other.

4. Traffic information was not passed to the Seminole crew or to the Jetstream crew as required by ATC MANOPS.

5. The pilots of both aircraft did not notice one another until they were very close.

Causes:

The tower controller did not pass traffic information to the pilots of the Jetstream and Seminole aircraft about one another's location. The two crews did not spot one another's aircraft until they were very close, resulting in a near miss.

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EAGLE AIR SERVICE
CESSNA 185F SKYWAGON C-GTBX
LASBY LAKE, SASKATCHEWAN
11 FEBRUARY 1988

BRIEF NUMBER: 88-C0028 (Accident)
LOCAL TIME: 0910 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	635	200
LAST 90 DAYS	200	200

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot completed a reconnaissance of the frozen lake surface, but conditions of poor light and falling snow made it difficult to discern large snow drifts on the surface. During the landing run, the right ski struck a drift, and the right landing gear fractured.

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CESSNA 150L C-FLCK
WINDSOR, ONTARIO
12 FEBRUARY 1988

REPORT NUMBER: 88-O/0050 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1515 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	46	46
LAST 90 DAYS	4	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

Approximately seven minutes after the aircraft took off from Windsor Airport and shortly after levelling off at 1,600 feet above sea level(asl), the engine (Continental O200A) sputtered and lost power. Power was regained when carburettor heat was applied, and the pilot elected to return to Windsor. After reporting that he was having engine problems, the pilot received clearance to land on runway 30. Shortly after this, the engine sputtered again and lost power. By adjusting the throttle, the pilot regained some power but not enough to sustain flight, and the aircraft began to descend. When it became apparent that the aircraft would not reach the airport, the pilot declared an emergency and force-landed in a park area. During the landing roll on the snow-covered surface, the aircraft nosed over. The pilot was uninjured, and the passenger received minor injuries to the left ankle.

The ground temperature at the time was –7.4 degrees Celsius, and the dew point was –15.2 degrees Celsius. The wind was from 290 degrees at 20 gusting to 25 knots.

Examination of the engine and fuel system did not reveal any faults which would have caused the loss of power. A serviceable propeller was fitted to the engine, and a full engine run was carried out. The engine ran smoothly and developed its rated power.

The engine was not equipped with the winterization kit as recommended by the aircraft manufacturer in the Pilot's Operating Handbook, for aircraft that consistently operate in temperatures below minus seven degrees Celsius. This kit consists of two shields to partially cover the nose cowl cap opening, additional heat ducting from the right exhaust manifold, and a carburettor airbox heat outlet cap and insulation for the engine crankcase breather line. These additions improve the cold weather performance by reducing excessive heat loss in the cylinders and open induction pipes and by providing a more abundant supply of carburettor heat when required. The right exhaust outlet was coated with a soft, black, sooty deposit, while the left stack exhibited the normal light grey-coloured deposits. Experience has shown that this black deposit occurs when the fuel/air mixture is too rich as happens when carburettor or induction icing has occurred.

The pilot was able to regain power initially by the use of carburettor heat. The inability of the carburettor heat system to maintain this power recovery may have been because of the lack of sufficient heat rise under steady application. The installation of the cap on the heat box outlet may have provided more heat. These aircraft are not equipped with a carburettor temperature gauge, nor is it a requirement. With a temperature gauge, the carburettor can be operated outside the icing probability range by applying the correct amount of carburettor heat.

The temperature and dew point prevailing at the time of the accident were not within the icing ranges of the

icing probability chart prepared by Transport Canada. When vapourized fuel leaves the carburettor via the induction pipes, especially in cold weather, there is a tendency for the liquid drops in the vapour to fall out during the journey along the bends and corners of the induction system, resulting in an unburnable fuel/air mixture. The Continental O200A has open induction pipes which expose the induction air to rapid cooling. The winter kit supplied by the manufacturer helps to reduce this possibility.

CONCLUSIONS:

Findings:

1. Shortly after the aircraft levelled off in cruise flight, the engine sputtered and lost power.

2. The pilot force-landed in a park area.

3. During the landing roll, the aircraft nosed over.

4. No faults were found in the engine or fuel system which would have caused the loss of power.

5. The aircraft was not equipped with a winterization kit as recommended by the manufacturer.

6. The temperature on the ground at the time of the accident was –7.4 degrees Celsius and lower at the altitude at which the aircraft was operating.

7. The temperature and humidity prevalent at the time were not conducive to the formation of carburettor icing according to the carb icing probability chart.

8. The presence of sooty deposits on the right stack showed that induction icing had occurred, resulting in power loss.

Causes:

The engine lost power because of induction icing.

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CENTRAL AIR TRANSPORT LIMITED
DE HAVILLAND DHC-3 OTTER CF-CZO
NEMEIGUSABINS LAKE, ONTARIO
20 FEBRUARY 1988

BRIEF NUMBER: 88-C0036 (Accident)
LOCAL TIME: 1130 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,414	500
LAST 90 DAYS	215	180

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The ski-equipped aircraft was on a charter flight from Big Trout Lake to Nemeigusabins Lake, Ontario. Shortly after touchdown at Nemeigusabins Lake, the left ski broke loose, twisted right, and dug into the snow causing the aircraft to pitch forward. The propeller struck the ice damaging the blades. The aircraft's left landing gear also incurred substantial damage.

This landing and the previous one were on snow-drifted lakes. The pilot felt the left ski skipping across the top of the drifts prior to failure.

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NUNASI-CENTRAL AIRLINES LIMITED
DOUGLAS DC-3 C-FIAR
POINTS NORTH LANDING AIRSTRIP, SASKATCHEWAN
21 FEBRUARY 1988

REPORT NUMBER: 88-C0037

Pilot Licence	Pilot-in-Command Airline	Co-Pilot Commercial	Check-Pilot Airline Transport
		Transport	
Total Flying Time	13,000 hr	1,100 hr	3,391 hr
Total on Type	2,500 hr	290 hr	3,003 hr
Total Last 90 Days	N/A	102 hr	156 hr

Injuries	Crew	Passengers	Others	Total
Fatal	-	-	-	-
Serious	-	-	-	-
Minor/None	3	-	-	3
Total	3	-	-	3

HISTORY OF THE FLIGHT:

The flight was scheduled to carry cargo from Points North Landing to Stony Rapids, Saskatchewan. The crew had waited for the weather to improve throughout the morning and early afternoon. When the weather cleared, the crew taxied the aircraft to a position left of centre line on runway 33 and commenced the take-off roll. The aircraft was at an airspeed of about 70 knots when the left main wheel struck a snowbank, and the aircraft veered to the left. The right main landing gear then struck the snowbank and collapsed, and the aircraft came to rest on its nose and right wing.

The accident occurred at lat 58°16′30″ N, long 104°04′52″ W at 1430 Central standard time (CST), during the hours of daylight. The accident site was approximately 1,550 feet above sea level (asl).

PERTINENT INFORMATION:

The cargo had been tied down with ropes and straps passed around the load and connected to snap fittings in the wall and floor tracks. The deceleration forces encountered during the occurrence were relatively mild, yet, the cargo shifted forward with sufficient force to pull the forward bulkhead from the floor.

ANALYSIS:

As there was no evidence of the aircraft having any malfunctions prior to the occurrence, the investigation centred on the environmental and runway conditions.

The overcast sky resulted in grey monotone light conditions making objects of similar colour difficult to distinguish from each other. The runway was bordered by snowbanks, and the entire area was covered by six to eight inches of fresh, dry snow, reducing visual cues and creating a whiteout condition.

The flight crew was aware of the inner snowbanks, but these were not clearly visible due to the whiteout conditions. The crew unwittingly lined up the aircraft left of centre line, possibly because the trees were cleared further back on the left side than on the right. During the take-off roll, because of the lack of visual cues, the crew inadvertently allowed the aircraft to drift to the left until the left main wheel struck the snowbank.

Had the deceleration forces been more severe, it is probable that the cargo would have shifted further forward and entered the cockpit area, with potentially dangerous results.

CONCLUSIONS:

Findings:

1. The runway was bordered by snowbanks.

2. The runway and surrounding area was covered with six to eight inches of fresh snow.

3. An obscured sky condition, monotone light, and fresh snow created a whiteout condition.

4. The flight crew was aware of the snowbanks, but they were not discernible because of the whiteout conditions.

5. During the take-off roll, the aircraft drifted to the left and struck a snowbank.

6. The cargo shifted forward during the occurrence.

7. The flight crew was certified and qualified for the flight in accordance with existing regulations.

8. The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

9. There was no evidence found of any airframe failure or system malfunction prior to or during the flight.

10. The weight and centre of gravity were within the prescribed limits.

Causes:

During the take-off roll in whiteout conditions, the crew inadvertently allowed the aircraft to drift left until it struck a snowbank.

SAFETY ACTION:

The Board has no recommendations to issue at this time.

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CESSNA 150M COMMUTER II C-GSAZ
MANNING, ALBERTA 36 mi N
26 FEBRUARY 1988

REPORT NUMBER: 88-W0036 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1330 MST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	331	240
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot departed from High Level, Alberta on a flight to Peace River, Alberta. Approximately 45 minutes into the flight, while flying 4,000 feet above ground level, the pilot felt dizzy and then lost consciousness. His next recollection was of the aircraft in an unusual attitude diving toward the trees. The aircraft flew in an inverted attitude into the trees and slid to the ground. The pilot exited the aircraft and, several hours later, flagged down a passing train and was taken to hospital.

On admission to hospital, a drug screen test was performed, and no drugs, including alcohol, were found present. There was no evidence of carbon monoxide poisoning. Later on, radiology examinations, as well as cardiovascular and neurological consultations and examinations were carried out, but no significant abnormality was found. The pilot stated that he was a regular drinker but had had little alcohol during the three days prior to the accident.

An in-depth analysis of the medical findings by a specialist in aviation medicine concluded that the pilot suffered a subtle partial incapacitation caused by hypoglycaemia (low blood sugar). The hypoglycaemia was due to fatty liver disease caused by the heavy consumption of alcohol. The pilot had consumed only toast and coffee during the 18 hours prior to the accident and a drink of grape juice just before the flight. The hypoglycaemic reaction took place because the pilot's liver was damaged by excessive alcohol consumption. The reaction was probably triggered by the high sugar content of the grape juice. The reaction caused incapacitation of the pilot during which he was not aware that the aircraft had departed from level flight.

CONCLUSIONS:

Findings:
1. The pilot experienced a temporary incapacitation due to hypoglycaemia.

2. The aircraft descended out of control and flew in an inverted attitude into the trees.

Causes:
The pilot became incapacitated probably due to a hypoglycaemic reaction resulting from fatty liver disease.

CESSNA 172M SKYHAWK II C-GCYH
FINDLATER, SASKATCHEWAN 2 mi S
25 JULY 1987

REPORT NUMBER: 87-C70058 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1930 CST
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	500	500
LAST 90 DAYS	29	29

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

Shortly after the aircraft lifted off from a 1,300-foot driveway, the pilot commenced a climbing left-hand turn. The aircraft rolled to the right, descended vertically, and struck the ground with the nose and right wing first. A fire that started forward of the fire wall was extinguished by rescuers before it could spread to the rest of the aircraft. The pilot, who was not wearing the available shoulder harness, received serious head injuries from the impact.

The weather was suitable for the flight; the aircraft weight was well below the maximum allowable take-off weight, and the centre of gravity was within the prescribed limits. The temperature of 27 degrees Celsius and the elevation of 2,030 feet above sea level resulted in a high density altitude. The wind was from the east at about 12 knots at the time of the accident, and the aircraft took off downwind. Ten degrees of flap was used for take-off, which would have shortened the ground run

but increased the distance required to clear a 50-foot obstacle.

The road used for take-off ran perpendicular to a grid road that had been used for one take-off and two landings prior to the commencement of this flight. A power line about 25 feet above the ground crossed the take-off path at the intersection with the grid road, and the elevation of the terrain increased beyond this point.

The pilot decided to take off on the shorter road to avoid the long taxi to the grid road and then fly under the power line before climbing. Witnesses reported that the aircraft was airborne when it passed under the power line and that, after this, the left climbing turn was commenced.

The pilot was not wearing the available shoulder harness because it was uncomfortable when tightened and would unfasten when loosened.

Although it was not definitely determined that the aircraft could not have safely departed under the existing circumstances of density altitude and obstructions, it is concluded that these were contributing factors. The aircraft stalled because the pilot allowed the airspeed to drop off.

The pilot's serious injuries may have been prevented had he been wearing the available shoulder harness.

CONCLUSIONS:

Findings:
1. Aircraft performance was reduced because of the high density altitude.

2. The area selected for take-off had known hazards.

3. The aircraft stalled during a climbing turn.

4. The pilot was not wearing the available shoulder harness.

Causes:
The aircraft stalled in a climbing turn shortly after take-off.

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PIPER PA-24-250 COMANCHE C-GIVE
BARKERVILLE, BRITISH COLUMBIA
26 JULY 1987

BRIEF NUMBER: 87-P70055 (Accident)
LOCAL TIME: 1315 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,400	1,400
LAST 90 DAYS	12	12

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot flew a circuit for a landing on the asphalt runway. Partial flaps were selected on approach and then retracted after touchdown. During the landing-roll, the pilot felt a shudder in the left wheel, and the aircraft veered to the left. The pilot applied right rudder, but he was unable to prevent the aircraft from rolling off the left side of the runway and into some small trees. The aircraft was substantially damaged; the pilot and passenger were uninjured.

The weather was fair, and the wind favoured the landing runway. Work had recently been done to the aircraft's brakes, and the pilot suspects that the left brake seized during the landing roll.

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CESSNA 177 RG CARDINAL C-GCEF
TEULON, MANITOBA
27 JULY 1987

BRIEF NUMBER: 87-C70059 (Accident)
LOCAL TIME: 1030 CDT
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	100	25
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

On the third of a series of practice landings at the private airstrip, the aircraft bounced. On the subsequent touchdown, the nose gear sheared, and the propeller and right wing tip struck the ground. The pilot was wearing a shoulder harness and was unhurt.

PIPER PA-18 SUPER CUB C-GDCG
BRENTON, NOVA SCOTIA
28 JULY 1987

BRIEF NUMBER: 87-A70026 (Accident)
LOCAL TIME: 2030 ADT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	111	N/A
LAST 90 DAYS	8	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The aircraft was landing after approaching at a higher than normal airspeed. On landing, the aircraft bounced twice then veered to the right. The pilot applied power to recover but was unable to clear trees alongside the runway. The right wing tip struck the trees, and the aircraft swung 180 degrees and crashed, coming to rest on the left wing tip and nose.

CHAMPION AERONCA 7ECA C-GACU
CRANBROOK AIRPORT, BRITISH COLUMBIA
29 JULY 1987

REPORT NUMBER: 87-P70057 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1409 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	800	7
LAST 90 DAYS	300	7

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was on a visual flight rules (VFR) flight from Beaverdell, British Columbia to Cranbrook, British Columbia. In preparation for landing, he obtained the wind speed and direction from the flight service station (FSS) operator and flew a right-hand circuit for a landing on runway 16. On landing, the tail-wheel-equipped aircraft touched down on the two main wheels, and, when the pilot moved the elevator control forward to keep the wheels on the ground, he felt vibrations from the right wheel shake the whole aircraft. The right main landing gear then collapsed and folded underneath the aircraft, and the wheel separated from the landing gear leg; the right wing struck the ground, and the aircraft swung to the right off the runway.

The reported winds at the Cranbrook Airport were variable between 090 and 120 degrees magnetic at 14 to 16 knots. According to the pilot, the wind at the landing end of the runway was less than 10 knots and about 30 degrees off the runway heading, as judged by the windsock closest to the threshold. However, the aircraft had touched down at the 1,000-foot marker where the wind velocity was closer to that reported by the FSS operator. This aircraft had a stall speed of 51 mph. Using the Cross-wind Landing Limitations Light Aircraft Chart in the Aeronautical Information Publication (AIP) Canada, the suggested maximum cross-wind at 30 and 90 degrees was 17 and 9 knots respectively. The pilot had about 150 hours on tail-wheel-equipped aircraft, but, on the Champion Aeronca, he had only seven hours, which he had accumulated in the three days preceding the occurrence.

The landing gear assembly was examined at the Canadian Aviation Safety Board Engineering Laboratory in Ottawa where it was determined that the landing gear

leg had broken free from the aircraft after the attachment U-bolt and thru-bolt had failed as a result of material overload and that the failure of the wheel axle was primarily the result of bending overload. It was further established that the thru-bolt was an AN part and not a Military Standard (MS) part as recommended in the applicable service letter. The classification of the U-bolt could not be positively identified.

Following reports of cracked and failed bolts, Bellanca issued Service Letter No. C-135 on 13 December 1978, recommending that inspection of the landing gear thru-bolt and U-bolt be performed on or before the next 100-hour inspection and at 100-hour intervals thereafter, and stating that parts conforming to Army Navy Standard (AN) were not acceptable.

The side-slip or wing-down landing method, whereby the aircraft's longitudinal axis is held parallel to the centre line of the runway and the upwind wheel makes contact with the surface first, is considered the most effective method for cross-wind landings.

The cross-wind component during the landing was in excess of that suggested in the AIP for this aircraft type, and the pilot did not employ the wing-down landing method to minimize the undesirable side load on the landing gear of the aircraft. As a result, the right landing gear was subjected to a side force which exceeded the strength of the attachment bolts. The thru-bolt, which was of a type not approved by the manufacturer, and the U-bolt failed in overload, and the landing gear assembly separated from the fuselage attachment.

CONCLUSIONS:

Findings:

1. The cross-wind component on landing was in excess of that suggested in the AIP for this aircraft type.

2. The pilot did not employ the wing-down method during the cross-wind landing.

3. The landing gear to fuselage attachment bolts failed as a result of material overload.

4. Bellanca Service Letter No. C-135 had not been complied with.

Causes:

The pilot did not use the correct cross-wind landing technique. Improper attachment bolts had been used in the landing gear assembly.

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CHAMPION 402 LANCER C-FMQC
FERNIE, BRITISH COLUMBIA 4 mi E
30 JULY 1987

REPORT NUMBER: 87-P70058 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0925 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	889	230
LAST 90 DAYS	28	28

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was on a flight from Elko, British Columbia to Medicine Hat, Alberta. Shortly after take-off from Elko, he filed a visual flight rules (VFR) flight plan by radio with the flight service station at Cranbrook, British Columbia. During his climb to altitude, the pilot entered a valley leading to higher terrain and then turned east along another valley. As he approached a ridge line between 6,000 to 6,500 feet above sea level (asl), the aircraft began to sink. The pilot turned the aircraft around but could not arrest its descent even though full power was used. The aircraft struck the ground and nosed over. The emergency locator transmitter (ELT) activated, and the seriously injured pilot was found and rescued by Search and Rescue (SAR).

The pilot, who held a commercial pilot licence, had flown infrequently in the 12 months preceding the occurrence. He had not flown between September of 1986 and June of 1987; since then, however, he had accumulated 28 hours in this aircraft. The aircraft was serviceable, its weight and balance were within the prescribed limits, and there was no evidence of any pre-occurrence failures or malfunctions.

The weather, as reported by the pilot, was suitable for the flight. At 0900 mountain daylight time (MDT), Sparwood, British Columbia, a station approximately 25 miles to the north of the occurrence site, reported scattered cloud at 12,000 and 15,000 feet above ground level, more than 15 miles visibility, a wind speed of two knots from the north, and a temperature of 16 degrees Celsius. Winds at the 9,000-foot level were estimated in the aftercast to have been 20 knots from 200 degrees true.

Transport Canada, in its pamphlet *Flying the Mountains*, recommends that pilots use VFR flyways or choose a well-used route and climb to a safe traversing altitude before entering a mountain valley. The accident pilot, rather than follow the VFR route along well-defined valleys as depicted on the VFR chart or climb to a safe height before entering the mountain valley, had elected to fly a direct route to destination, over high terrain, and to climb en route.

Because of local effects, winds in the mountains, especially those encountered below the mountain top, are impossible to predict. The pilot was climbing in the rising valley, and, as he approached the ridge line, just below its crest, he probably encountered a local condition of subsiding air caused either by uneven surface heating or by topographic effect. The aircraft began to sink, and, even though the pilot applied full power and reversed course, he could not prevent the aircraft from striking the ground.

CONCLUSIONS:

Findings:

1. The pilot did not follow the VFR route as depicted on the VFR chart.

2. The pilot did not climb to a safe altitude before entering a valley in an area of high terrain.

3. The pilot approached a ridge line below its crest and encountered subsiding air.

4. The pilot could not arrest the aircraft's descent, and the aircraft struck the ground.

Causes:

The pilot entered an area of high terrain at too low an altitude to provide a safe margin of terrain clearance, and subsiding air caused the aircraft to strike the ground.

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CESSNA 172 SKYHAWK C-GIPP
WESTHAM ISLAND, BRITISH COLUMBIA
30 JULY 1987

REPORT NUMBER: 87-P70059 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2230 PDT
OPERATION: Private Other
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	295	225
LAST 90 DAYS	52	52

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

SUMMARY REPORT:

The three passengers had arranged for the pilot to transport them from Port Hardy to Boundary Bay, British Columbia on the evening of 30 July 1987. Since the pilot's own Cessna 172 was unavailable, he rented a similar model Cessna 172 Skyhawk, C-GIPP, for the flight. The pilot refuelled the aircraft, topping up both left and right fuel tanks. The aircraft, with only the pilot on board, then departed Delta Airpark at 1805 Pacific daylight time (PDT) and flew to the southwest over Active Pass to avoid the busy Vancouver Airport before setting course for Port Hardy. The pilot levelled the aircraft at 4,500 feet above sea level (asl), set the engine rpm to 2450, and leaned the mixture. Following a normal flight, the aircraft landed at Port Hardy at 2015 PDT. At Port Hardy, the pilot opened and visually checked both fuel tanks to ensure that the fuel was feeding evenly.

The return flight, with the pilot and the three passengers on board, departed Port Hardy at 2033 PDT. After levelling off at 5,500 feet asl, the pilot set the engine rpm to 2350 and followed his normal engine fuel leaning procedures. On the return trip, the pilot again flew to Active Pass, then turned for a direct flight to Boundary Bay.

Half-way across the Strait of Georgia, the engine suddenly stopped. The pilot checked the engine magnetos, selected the carburettor to full rich, and primed the engine. He then selected the right fuel tank, then the left fuel tank while he attempted unsuccessful engine starts. Prior to ditching the aircraft, the pilot asked the passengers to lock open both left and right doors. He applied full flap and, at about 10 feet above the water, pulled the nose up and stalled the aircraft. The aircraft's tail contacted the water first. The aircraft then nosed into the water but remained upright as it came to rest in six feet

of water. The pilot and the passengers escaped with only minor injuries.

During the unpowered glide, the pilot radioed a MAYDAY call that was received by Vancouver Tower at 2230 PDT. The tower notified the Coast Guard who dispatched a hovercraft to the rescue.

Winds between 4,000 and 6,000 feet asl were from the southwest at less than 10 knots. Visibility was unrestricted, and the cloud base was a scattered layer at 6,000 feet asl.

The aircraft was certified and maintained in accordance with existing regulations, and the aircraft's weight and balance were within the prescribed limits. Following aircraft recovery, both fuel tanks were checked for fuel. The left tank was empty, and the right tank contained approximately one-half litre of fuel. The carburettor was removed, and approximately one-quarter cup of fuel was found floating on sea water.

The pilot noted that, after he had refuelled the aircraft, both the left and the right fuel gauges were inaccurate. He used the cruise performance chart found in the Pilot's Operating Handbook to calculate his fuel consumption. With maximum gross weight, standard atmospheric conditions at 5,000 feet asl, and a lean fuel mixture, the chart indicates that the expected endurance with standard tanks and no fuel reserve should be 5.1 hours. This chart also indicates that at 2,500 feet asl, fuel consumption would be 10.5 gallons per hour producing an endurance of 3.4 hours. Both calculations are for zero fuel reserve with a lean fuel mixture. On this occasion, the engine stopped from fuel starvation after approximately 4.1 hours of flight, not counting ground running time.

The pilot reported that he had flown his own Cessna 172 several times from Langley or Abbotsford to Port Hardy and returned without refuelling. On these previous flights, he had leaned the fuel mixture until the engine began to run rough, then he moved the mixture control one-quarter inch toward rich. On the accident flight, he had used this same fuel leaning procedure.

The Cessna Pilot's Operating Handbook states that "to achieve the recommended lean mixture fuel consumption figures shown in Section 5, the mixture should be leaned until engine rpm peaks and drops 25 to 50 rpm."

The pilot did not use the recommended fuel leaning procedures. Any deviation from the recommended fuel leaning procedure would have produced a corresponding deviation in the rate of fuel consumption and made the use of the cruise performance chart invalid. The procedure used by the pilot on his own aircraft may not necessarily produce the same result when used on similar aircraft types. It is possible that the fuel leaning procedure used produced a considerably higher rate of fuel consumption than the pilot had previously experienced. The rate of consumption was such that the pilot was unable to complete the planned flight before running out of fuel.

Since the pilot did not used the recommended fuel leaning procedures, he would not have known the engine's rate of fuel consumption and would not have been able to assess accurately the fuel remaining on board when he landed in Port Hardy.

CONCLUSIONS:

Findings:

1. The pilot did not follow the recommended fuel leaning procedures, and the aircraft used more fuel than expected.

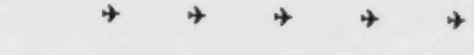
2. The fuel gauges were inaccurate.

3. The pilot departed Port Hardy for Boundary Bay without adequate fuel for the flight.

4. The pilot continued flight until the engine stopped due to fuel exhaustion.

Causes:

The pilot departed Port Hardy for Boundary Bay without adequate fuel for the flight.



CESSNA 185A SKYWAGON C-FOMF
CHIEVES CREEK, BRITISH COLUMBIA
01 AUGUST 1987

REPORT NUMBER: 87-W70052 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1000 PDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	720	60
LAST 90 DAYS	50	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

CESSNA 172N SKYHAWK C-GRJN SUNSHINE, ONTARIO 1.5 mi SSW 01 AUGUST 1987

REPORT NUMBER: 87-C70062 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1030 EDT (Estimated)
OPERATION: Private Other
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	80	80
LAST 90 DAYS	23	23

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	1	-	-

SUMMARY REPORT:

The pilot was landing on a bush strip surrounded by trees and which had a steep ravine across the threshold. The approach was into a 10-knot wind and was flown with full flaps at an airspeed of about 65 knots. When the aircraft was passing over the ravine at about tree-top height, just short of the threshold, it suddenly began to sink. The stall warning sounded, and the pilot added power to arrest the descent, but the aircraft touched down about 100 feet short of the airstrip. The left wheel hit a large rock, the aircraft skipped and then touched down on the runway. As the tail came down, the left main gear slowly collapsed. The left wing tip dragged on the ground, and the aircraft came to rest facing about 90 degrees left of the direction of landing.

The wind blowing over the ravine could have caused a downdraft just before the runway threshold which, in turn, could have caused the aircraft to descend at an increased rate. Although the pilot added power, he added it too late to prevent the aircraft from landing short of the runway.

CONCLUSIONS:

Findings:
1. The aircraft touched down short of the runway, damaging the left landing gear.

2. The pilot added power too late to arrest the aircraft's descent.

Causes:
The aircraft touched down short of the runway, probably due to a downdraft on approach.

HISTORY OF THE FLIGHT:

The aircraft departed Manitouwadge, Ontario, at approximately 0730 EDT, for a visual flight rules (VFR) flight to Fort Frances. The pilot and his passenger planned to attend a meeting at the destination city. About two and a half hours after take-off, the aircraft was sighted approximately 20 miles northwest of Thunder Bay, flying very low over the highway, in low cloud ceilings and poor visibility conditions. The last sighting was at approximately 1020 EDT, at a point 3.5 miles from the crash site. The estimated time of the accident was 1030 EDT.

A flight plan had not been filed, and the aircraft was not reported missing until 38 hours after the estimated time of the accident. A search was initiated, and a private aircraft located the crash site near the top of a hill, 13 hours later. The pilot died at impact, and the passenger survived for a few minutes.

PERTINENT INFORMATION:

The aircraft was located approximately 100 feet from the top of a 1,600-foot hill in rugged, treed terrain. The aircraft descended through trees at an angle of about 30 degrees to the horizontal, on a heading of approximately 240 degrees magnetic. It then rotated through 180 degrees and came to rest 100 feet from the first point of contact.

An examination of the engine and propeller indicated that the engine was producing power at impact. Primary flight and powerplant controls were found attached. Clean aviation grade fuel was found in the carburettor. The fuel quantity in the aircraft at the time of the crash could not be determined, as a fuel line had ruptured. The aircraft had been filled to capacity two days prior to the

flight and had not flown in the intervening period. With full fuel tanks, the aircraft is capable of flying for more than five hours at normal cruising power.

The emergency locator transmitter (ELT) did not activate and was found with the switch in the OFF position. When turned on, the ELT functioned properly. Both occupants were wearing their lap belts at the time of impact, but the available shoulder harnesses for both seats were found in the stowed position.

The direct route distance was 300 miles, or about three hours flying time at normal cruising speed. The accident site is located slightly more than half-way along and 25 miles south of the direct route track. The estimated time of the accident was three hours after take-off, so the direct route was not followed. The actual track flown could not be determined.

The pilot did not file a flight plan prior to, or after take-off. There was no record of the pilot having received a weather briefing before take-off, and he did not transmit to any controlling agency while en route.

Good VFR weather conditions were reported in the Manitouwadge area at the time of take-off. These reports are supported by actual observations at the nearest weather reporting stations.

The area weather forecast for the latter half of the route, available before the aircraft took off, called for broken ceilings 2,500 to 3,000 feet above sea level, with isolated cumulonimbus clouds, especially in the area of the American border. Patchy stratus ceilings, 400 to 1,000 feet above ground level (agl), were forecast, with visibilities one-half to three miles in light drizzle and fog. A later forecast, issued at the time of take-off, remained the same, except that frequent stratus ceilings of 300 to 1,000 feet agl were forecast.

The destination airport was forecast to have ceilings at 200 feet agl and two miles visibility in fog, with occasional visibilities of one-half mile in fog and a chance of thunderstorms.

One-half hour before take-off, the destination weather was reported as thin obscured, estimated ceiling 900 feet agl and three-eighths mile visibility in fog. Later on, ceilings lowered to 200 feet agl and remained there throughout the period of the flight.

Ceilings at Thunder Bay, located 20 miles southeast of the crash site, were reported to be between 200 and 300 feet agl with visibilities varying from two to two and one-half miles in fog throughout the period in question.

Observers who sighted the aircraft in the accident area noted that there was heavy fog, with mist and very poor visibility. A helicopter pilot, flying inbound to Thunder Bay, elected to land about 20 miles north of the airport because of poor weather.

The pilot had purchased the aircraft in 1985, and, shortly thereafter, it suffered an engine fire and was out of service until March 1987. No record was found indicating that the inexperienced pilot flew during that period. He did not hold an instrument rating.

ANALYSIS:

There was no evidence that an aircraft or engine malfunction contributed to the accident.

The pilot did not file a flight plan, and there was no evidence that he had checked the weather, either before or after take-off. Had he done so, it is doubtful that he would have proceeded with the flight, given the actual and forecast conditions. It is possible that the good weather in the departure area led the pilot to believe that weather conditions en route were satisfactory for the flight.

Three observers noted the aircraft flying near the accident site in very poor weather in rugged, hilly terrain. It is certain that the pilot did not turn back when he initially encountered poor weather but decided to continue the flight. The investigation concluded that the pilot flew into a hill, while attempting to maintain visual contact with the ground, in extremely poor weather conditions.

The pilot's wife did not report the aircraft missing for 38 hours because she was confident in his flying ability and good sense. The fact that the ELT was not turned on delayed search initiation and prolonged search time.

CONCLUSIONS:

Findings:

1. The aircraft flew into a hill in extremely poor weather conditions.

2. The pilot did not receive a weather briefing prior to the flight.

3. The actual and forecast weather were unsuitable for the flight.

4. The pilot did not file a flight plan.

5. The pilot did not contact any agency en route to obtain weather information.

6. The aircraft was not reported missing until 38 hours after the accident.

7. The ELT was found with the switch in the OFF position.

8. The occupants were not wearing the available shoulder harnesses.

Causes:
The pilot had not properly planned the flight and continued flight into deteriorating weather.

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PIPER PA-28 CHEROKEE C-FTCF
VALCOURT, QUÉBEC
05 AUGUST 1987

BRIEF NUMBER: 87-Q70034 (Accident)
LOCAL TIME: 2025 EDT
OPERATION: Private Company Business
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,000	21
LAST 90 DAYS	21	21

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The aircraft was approaching the Valcourt Airport just prior to sunset. The pilot obtained the airfield information and, because of his unfamiliarity with the runway in use, carried out an airborne inspection of the airfield. The runway threshold was displaced 500 feet but was not indicated as such in the Visual Flight Rules Flight Supplement. The pilot did not notice a wire fence and an obsolete light stand, both approximately three feet high and located 50 feet prior to the apparent runway threshold. On final approach, the aircraft struck both the fence and the light stand, tearing off the right main landing gear and causing some minor damage to the right flap. The pilot carried out an overshoot, climbed to altitude, and burned off fuel. He then carried out a landing, holding the right wing up as long as possible before finally settling the wing on the grass beside the paved runway. The aircraft slid to a halt with no further damage. The occupants escaped unhurt.

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PIPER PA-11 C-FGNB
TOAD RIVER/MILE 422 (ALASKA HIGHWAY), BRITISH COLUMBIA
05 AUGUST 1987

REPORT NUMBER: 87-W70053 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0700 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	375	250
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot took off from a 950-foot-long sand strip on a river in northern British Columbia. Just after lift-off, while the pilot was holding the aircraft close to the ground to build up speed, the aircraft drifted slightly to the right. The right main wheel struck the top of a rock beside the runway, forcing the landing gear leg outwards and to the rear. Not wishing to attempt a landing back on the sand strip, the pilot proceeded north to Toad River, where it was easier to have repairs made to the aircraft. On arrival at Toad River, the pilot carried out a smooth landing on the left main wheel while attempting to hold the right main wheel off the runway as long as possible. When the right main wheel contacted the ground, the landing gear leg collapsed, and the aircraft nosed down.

The pilot had made several take-offs and landings at the sand strip and was satisfied that it was suitable for the aircraft. Prior to the flight, he had completed the weight and balance and found it to be within limits. He had also checked the density altitude against runway length and aircraft performance and found the conditions satisfactory. To determine wind direction and speed, the pilot had set up a ribbon as a wind indicator and noticed that there was a two- or three- mile per hour cross-wind from the left for take-off. There were numerous large rocks on both sides of the strip.

The Toad River Airstrip was 2,300 feet long by 80 feet wide, with easy access by vehicle for retrieval of the aircraft.

The pilot allowed the aircraft to drift to the right shortly after take-off, and, as a result, the right main gear struck the rock and was damaged. This damage resulted in the

right gear leg collapsing during the subsequent landing, causing substantial damage to the aircraft when it nosed down.

CONCLUSIONS:

Findings:
1. The pilot allowed the aircraft to drift to the right after take-off.

2. The right main gear struck a rock, causing damage to the gear leg.

3. The damaged gear leg collapsed on landing.

4. The aircraft nosed over and was substantially damaged when the gear collapsed.

Causes:
The pilot did not maintain directional control during take-off.

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AERONCA IICC CHIEF C-FJMN
ST-TITE AIRPORT, QUÉBEC
06 AUGUST 1987

BRIEF NUMBER: 87-Q70035 (Accident)
LOCAL TIME: 1410 EDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	107	10
LAST 90 DAYS	18	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

After completing the ground checks, the pilot advanced the throttle for take-off. There were cross-winds gusting from 10 to 15 miles per hour. The aircraft took off and was at an altitude of about 15 feet above ground level when a downdraft caused the aircraft to descend. The pilot applied the rudder control bar; however, the aircraft touched the ground beside the runway. The pilot maintained full power and pulled on the control column to take off again. The aircraft regained altitude before descending again. The propeller touched the ground about 1,600 feet from the point of departure before the aircraft came to rest. The aircraft sustained substantial damage; the pilot and the passenger exited uninjured.

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STINSON 108-2 C-FBBM
COURTENAY AIRPARK, BRITISH COLUMBIA
09 AUGUST 1987

BRIEF NUMBER: 87-P70065 (Accident)
LOCAL TIME: 1955 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	105	11
LAST 90 DAYS	18	11

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot flew the landing approach at 70 knots with the flaps extended. The aircraft touched down hard on the runway and bounced back into the air. When the aircraft landed again, it veered sharply to the left and ran off the runway onto the grass. The pilot applied power in an attempt to regain control; however, the aircraft ground looped, nosed down into the grass, and came to a stop. The three occupants suffered minor injuries, and the aircraft was substantially damaged.

The pilot reported that he was attempting a short-field landing and that he forced the aircraft onto the runway at too high an airspeed. He also said that the tail wheel may have jammed off centre as a result of the hard landing.

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PIPER PA-28-140 CHEROKEE CF-SPU
BOSTON BAR, BRITISH COLUMBIA
09 AUGUST 1987

BRIEF NUMBER: 87-P70067 (Accident)
LOCAL TIME: 1310 PDT
OPERATION: Private Rcretional
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	450	400
LAST 90 DAYS	-	-

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot and his passenger were on a sightseeing flight through the Fraser River Canyon, and they decided to land at Boston Bar, British Columbia. The wind sock at the airstrip indicated that a gusty cross-wind could be expected for landing. The temperature was about 38 degrees Celsius, and the sky was clear.

On final approach, the cross-wind was not evident. At about 100 feet short of the runway, the aircraft suddenly lost height, and its right wing struck the top of a tree. The aircraft fell to the ground short of the runway and was substantially damaged; the pilot and passenger were not injured.

The pilot believes that a lull in the wind or a downdraft caused the aircraft to lose height and that a steeper, full-flap approach would have prevented the accident. The pilot had selected partial flap for the landing.

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BEECH 200 N141GS
GOOSE BAY, NEWFOUNDLAND 60 mi E
12 AUGUST 1987

BRIEF NUMBER: 87-A74963 (Incident)
LOCAL TIME: 0949 NDT
OPERATION: Private Ferry
DAMAGE: Nil
PILOT LICENCE: Airline Transport (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	7,500	150
LAST 90 DAYS	100	60

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The aircraft was cruising at flight level 280 when the right engine fuel pressure started to fluctuate, accompanied by a decrease in torque and fluctuations in inter-turbine temperature (ITT). After about 15 minutes when the ITT started to exceed limits, the pilot secured the engine. The pilot then selected fuel cross-feed, and the left engine fuel pressure started to fluctuate. The pilot turned off the fuel cross-feed, and the left engine operations returned to normal. The problems with the right engine were caused by a fuel control malfunction as a result of ice forming in air lines used to sense engine parameters. The outside air temperature was minus 38 degrees Celsius. The aircraft was landed without further incident at Goose Bay.

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CESSNA 182G N3408S
ST-ANICET, QUÉBEC 2 mi W
15 AUGUST 1987

REPORT NUMBER: 87-Q70902 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1040 EDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Commercial (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,726	N/A
LAST 90 DAYS	2	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	2	1	-

HISTORY OF THE FLIGHT:

The pilot and three passengers departed Malone, New York, U.S.A. on a short sightseeing flight, which included passing by a cottage owned by the pilot and situated on a small island in the St. Lawrence River. An initial pass was accomplished at about 50 feet above ground level (agl). During the second pass, the wheel-equipped aircraft contacted the river surface, bounced once before striking the water, and then sank. The pilot and one passenger received serious injuries, and the other two passengers were fatally injured.

PERTINENT INFORMATION:

Visual flight rules (VFR) conditions existed in the area of the accident. The visibility was four miles in haze, and the winds were light. The temperature was 22 degrees Celsius, and the dew point was 19 degrees Celsius. According to Transport Canada's Aeronautical Information Publication (AIP) Canada, such a spread between the temperature and dew point would be conducive to carburettor icing.

There were no indications of any pre-occurrence failures of the flight controls or airframe. The flaps were in the retracted position. The engine was test run after cleaning and was able to develop cruise power. Damage to the propeller was consistent with at least partial engine power upon impact.

The pilot reported that the engine suddenly lost power and that he was concentrating on regaining power when the aircraft struck the river. The surviving passenger stated that the pilot was engaged in a conversation with the right front-seat passenger when the aircraft struck the water. She also recalled a steady engine noise prior to impact. Witnesses on the water did not notice any change in the sound of the engine and confirmed that the final descent was long and gradual until contact with the water. Throughout the gradual descent, the speed of the aircraft was not reduced, no turns were made toward the land, and the pilot did not lower the flaps.

The aircraft was fitted with thread-through-type seat-belts with serrated cam tongue buckles. These belts fill up and become difficult to release when wet. One survivor, the left rear-seat passenger, who was not familiar with this type of seat-belt, was not able to undo her seat-belt without the pilot's assistance after immersion. The right front-seat passenger sustained head injuries as a result of the impact and drowned. The aircraft was not equipped with shoulder harnesses. The young child in the right rear seat was projected from the aircraft and drowned. No life-vests were found on board the aircraft.

ANALYSIS:

Carburettor icing normally results in a gradual loss of power. Any sudden loss of power would be accompanied by a change in engine noise. The steady engine noise reported by the surviving passenger and the witnesses on the water and the absence of any mechanical discrepancies of the engine rule out the possibility of a sudden loss of power. The long gradual descent coupled with the absence of changes in the aircraft configuration in preparation for a ditching indicate that the pilot was not aware of the aircraft's proximity to the water surface, although control was maintained throughout the flight. Because the pilot was engaged in a conversation with the front-seat passenger, he may not have been aware of how close the aircraft was to the water.

CONCLUSIONS:

Findings:

1. The pilot was not attentive to the aircraft altitude or flight path, despite his planned low altitude.

2. The aircraft was under control of the pilot until water contact.

3. The aircraft was not prepared or configured for ditching.

4. The weather was adequate for the proposed VFR flight.

5. There were no mechanical or airframe failures prior to water impact.

6. The aircraft was fitted with thread-through-type seat-belts with serrated cam tongue buckles which fill up and become difficult to release when wet.

Causes:

The pilot was not attentive to the aircraft altitude or flight path and allowed the aircraft to continue descending until it struck the water.

BEECH A23-19 MUSKETEER CF-UCF
CROUSE CREEK AIRSTRIP, BRITISH COLUMBIA
16 AUGUST 1987

REPORT NUMBER: 87-P70070 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1000 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,200	500
LAST 90 DAYS	5	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The aircraft, carrying the pilot and two passengers, was departing from a private strip near Rock Creek, British Columbia, for a flight to Langley, British Columbia. During the take-off, the aircraft accelerated slowly, but the pilot did not choose to reject the take-off while there was sufficient runway length for stopping. After lift-off towards the south, the aircraft would not climb, and the pilot realized that the aircraft would be unable to clear two power lines crossing the departure path. The ground fell away steeply at the end of the runway, so the pilot followed the contour of the terrain, flew between the wires, and descended over the meadow below. The aircraft still would not climb, and, when the aircraft approached a stand of tall trees, the pilot turned to avoid them. During the turn, the aircraft contacted the ground in the meadow. The landing gear collapsed, and the aircraft slid to a stop on its fuselage.

The weather at the time of the accident was fair, with good visibility and a temperature of 12 degrees Celsius. The pilot reported that the winds were light; however, the owner of the airstrip and his son, who was a pilot, both witnessed the accident, and stated that the winds were from the north at about five to seven knots. They considered the wind direction to be unusual as south winds are prevalent in the river valley.

The airstrip is at an elevation of 2,160 feet above sea level; it is oriented north/south and is 2,500 feet long. The surface of the strip was level, and, at the time of the accident, it was covered with weeds one foot high. The terrain at the south end of the runway sloped down to a meadow, 50 feet below. Two power lines, one above the other, crossed the departure path 60 feet beyond the end of the runway, and the power line poles were set in the meadow. The upper power line was five feet higher than the elevation of the end of the runway, and the other power line was 10 feet below the first.

The weight of the aircraft at the time of the accident was calculated to be at the maximum permitted weight of 2,200 pounds, and the centre of gravity was within the prescribed limits. The aircraft had no known pre-flight unserviceabilities, and the pilot reported that all systems were operating properly at the time of the accident. The aircraft was not equipped with shoulder harnesses.

The pilot's licence validation certificate had expired some months prior to the accident, but there was no evidence that a medical problem affected his performance.

The aircraft was not able to take off safely from the 2,500-foot runway because the take-off was attempted with a tail wind, with the aircraft loaded to its maximum weight; in addition, the tall vegetation on the runway impeded the aircraft's ability to accelerate to take-off speed. Instead of rejecting the take-off, the pilot forced the aircraft into the air torward the end of the runway, and the aircraft was then unable to climb out of ground effect. After flying off the runway and between the power lines, the aircraft was still unable to maintain altitude, and it flew into the ground when the pilot was forced to turn to avoid trees in the path of the aircraft.

FINDINGS:

Cause Related:
1. Tall vegetation on the runway impeded the aircraft's ability to accelerate to take-off speed.

2. The take-off was attempted with a tail wind.

3. The pilot did not reject the take-off attempt when it became obvious that the aircraft could not accelerate to the normal take-off speed.

Other:
-Nil-

CESSNA 172M SKYHAWK C-GSEX
STRATHMORE, ALBERTA 2 mi NE
18 AUGUST 1987

REPORT NUMBER: 87-W70055 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2045 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	300	100
LAST 90 DAYS	10	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and one passenger departed from Calgary International Airport on a pleasure flight to a private farm strip near Strathmore, Alberta. Upon arrival, the pilot joined the circuit for the strip downwind and landed with 30 degrees of flap selected on a cultivated area adjacent and parallel to the turf strip where he had intended to land. The aircraft had rolled approximately 600 feet when the nosewheel dug into soft soil, and the aircraft gently nosed over.

The pilot had landed at this stip on numerous other occasions. He reported that, at the time of the occurrence, a thunderstorm to the west reduced the light from the setting sun, making it difficult to locate the turf strip and that the freshly cultivated area looked like the stip. The turf strip was marked by coloured conical markers, while the cultivated area had been marked with a white lime "X" at both ends; the lime markers, however, had been washed away by recent rain showers.

The switch of the aircraft's recently certified emergency locator transmitter (ELT) was found in the OFF position. When tested after the accident, the ELT functioned normally.

The pilot did not overfly the farm to confirm the location and condition of the turf strip prior to landing. Because of the reduced light conditions caused by the thunderstorm, the pilot did not see the coloured conical markers lining the strip, and he mistook the cultivated area for the landing strip. The pilot was not aware of his mistake until the aircraft nosed over at the end of the landing run.

FINDIN

Cause Related:
1. The reduced light conditions resulted in the pilot mistaking a freshly cultivated area for the turf landing strip.

2. Prior to landing, the pilot had not overflown the strip to confirm its location and condition.

Other:
1. The white X's at the ends of the cultivated area had been washed away by recent rain showers.

2. The ELT switch was in the OFF position.

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CESSNA 172H SKYHAWK CF-UGU
TEESWATER, ONTARIO
19 AUGUST 1987

REPORT NUMBER: 87-O/70062 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1915 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	200	200
LAST 90 DAYS	14	14

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

As it became airborne during the take-off from a narrow, grass strip located in a cornfield, the aircraft drifted to the right, and the right wing tip struck cornstalks at the edge of the runway. The aircraft then swerved to the right and continued into the cornfield before coming to a stop.

The cornstalks surrounding the runway were eight to nine feet high. The runway was 40 feet wide, with an unobstructed runway opening width in the cornfield of about 45 feet; the wing span of the aircraft was 36 feet.

At the time of the accident, the wind was from the north at five knots. The aircraft was allowed to drift on take-off, and, due to the limited wing tip clearance, the right wing struck the cornstalks. Directional control was then lost, and the aircraft swerved to the right into the cornfield.

FINDINGS:

Cause Related:
1. Directional control of the aircraft was not maintained during take-off.

2. The wing tip clearance was not sufficient to allow an aircraft with a 36-foot wing span to take off safely from this runway.

Other:
-Nil-

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ZENITH (Amateur-built) C-GIMI
PRINCETON, BRITISH COLUMBIA 18 mi S
20 AUGUST 1987

BRIEF NUMBER: 87-P70071 (Accident)
LOCAL TIME: 1030 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	525	450
LAST 90 DAYS	45	45

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot and his wife departed Pincer Creek, Alberta on a three and one-half hour visual flight rules (VFR) flight to Chilliwack, British Columbia. After passing Princeton, they encountered clouds that eventually blocked their path; the pilot reversed course and flew toward Princeton. About four hours after take-off and 18 miles short of Princeton, the aircraft's engine stopped because of fuel exhaustion. The pilot force-landed the aircraft in a clearing.

The pilot reported that unexpected strong head winds and manoeuvring to avoid clouds caused an increase in the fuel consumed. The fuel tanks were empty 20 to 30 minutes before he expected.

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CESSNA 152 II C-GDWJ
NOTRE-DAME-DE-LA-PAIX, QUÉBEC
23 AUGUST 1987

REPORT NUMBER: 87-Q70036 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2220 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,300	200
LAST 90 DAYS	25	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

In the late afternoon, the pilot undertook a night visual flight rules (VFR) flight between Rivière-du-Loup, Québec and St-André-Avellin, Québec. During the descent, after a 3 hour and 20 minute flight, the engine backfired. The pilot resumed level flight, and the backfiring stopped. Shortly thereafter, the engine backfired again and stopped. The pilot force-landed in a ploughed field; the nose gear collapsed, and the aircraft nosed over.

Two days before the departure from Rivière-du-Loup, an airport employee had refuelled the aircraft. The pilot had been informed immediately before his departure that he would have to face head winds of 25 to 35 knots. He had calculated that the 270-nautical-mile return flight, at a ground speed of 70 knots, would take three and one-quarter hours and that the tanks contained enough fuel to fly for four and one-half hours. The manufacturer's manual indicates that, at 75 per cent power, the aircraft's endurance is four and one-half flying hours; the pilot said he used 75 per cent power. The pilot did not check the amount of fuel in the tanks nor the condition of the tanks before departure; he relied on the electric gauge readings.

During the inspection of the aircraft after the accident, a run-up confirmed that there was no pre-accident mechanical malfunction and that there was only one and one-half gallons of unusable fuel in the tanks.

When the wings were dismantled, it was discovered that the outside of the right fuel tank was soiled with fuel deposits, indicating a leak at the welded outlet fitting.

Since the pilot did not check the amount of fuel in the tanks nor their condition before departure, he was un-

able to determine the exact amount of fuel that he had on board or notice the leak under the right wing. The fuel leaked out during the two days prior to the flight. Consequently, the engine stopped because of fuel exhaustion.

FINDINGS:

Cause Related:
1. Before departure, the pilot did not check the amount of fuel in the tanks nor the condition of the tanks.

2. The outlet fitting of the right fuel tank was leaking.

3. The engine stopped because of fuel exhaustion.

Other:
-Nil-

CESSNA 150J C-FXYP
MOOSOMIN, SASKATCHEWAN 10 mi S
23 AUGUST 1987

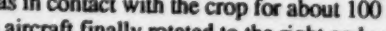
BRIEF NUMBER: 87-C70064 (Accident)
LOCAL TIME: 0605 CDT
OPERATION: Private Other
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	139	139
LAST 90 DAYS	23	23

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was flying low over his field to stir the unseasonably cold air in an attempt to minimize frost damage to the crop. The weather was clear and cold, and there was no wind. While turning over the field, the aircraft struck slipstream from the previous circuit; the aircraft dropped, and the left wing tip contacted the crop. The wing was in contact with the crop for about 100 feet before the aircraft finally rotated to the right and came to rest on its nose.



CESSNA 310 C-FOOI
ROSETOWN, SASKATCHEWAN 8 mi NW
23 AUGUST 1987

BRIEF NUMBER: 87-C70066 (Accident)
LOCAL TIME: 1515 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	26,996	3,100
LAST 90 DAYS	0	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

While the aircraft was taxiing down the farm strip for take-off, the nosewheel contacted soft ground and collapsed.

PIPER PA-25-150 PAWNEE C-FVTW
MACDONALD, MANITOBA 4 mi NW
23 AUGUST 1987

REPORT NUMBER: 87-C70067 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2000 CDT
OPERATION: Private Aerial Spray
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	500	225
LAST 90 DAYS	61	61

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was taking off to spray some crops in the local area. The take-off run and lift-off were normal, and the pilot commenced a climb. At a height of about 40 feet above ground, the aircraft, while still in a climbing attitude, started to sink. The pilot lowered the nose of the aircraft and selected 10 to 15 degrees of flap in an attempt to arrest the descent. He did not dump the chemical that was in the hopper. The aircraft continued to lose

altitude, and, when it became apparent that collision with the ground was imminent, the pilot raised the nose, and the aircraft struck the ground tail wheel first. The aircraft rotated 180 degrees clockwise and came to a stop in an upright attitude. The pilot, who was wearing a helmet and shoulder harness, escaped from the aircraft uninjured.

When the pilot exited the aircraft, he noted that the wind, which had been from the north prior to the start of the take-off, was now from the south. Numerous changes in wind direction at that time were reported by combine and truck operators in the immediate area.

The aircraft weight and balance were within the prescribed limits.

The aircraft encountered wind shear in the initial climb, causing a loss of airspeed and resulting in the aircraft striking the ground.

CONCLUSIONS:

Findings:
1. The aircraft encountered wind shear in the initial climb.

2. The wind shear resulted in a loss of airspeed for which the pilot could not compensate.

3. The pilot did not use the emergency dump to jettison the spray load.

4. The pilot was wearing a helmet and a shoulder harness.

Causes:
The wind shear encountered during the initial climb resulted in a loss of airspeed, and the pilot was unable to maintain flight. The non-jettison of the spray load contributed to the accident.

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PIPER PA-32-260 CHEROKEE C-FGFN HUMBOLDT AIRPORT, SASKATCHEWAN 26 AUGUST 1987

REPORT NUMBER: 87-C70068 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2130 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	700	600
LAST 90 DAYS	14	14

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and passenger had taken off in the aircraft for a short local pleasure flight and were at an altitude of 100 feet above the ground, when the engine (Lycoming 0-540-E4B5) lost power. The pilot turned the aircraft to avoid some trees and carried out a forced landing. He was unable to stop the aircraft before it ran over a row of rocks bordering the adjacent field. The aircraft suffered substantial damage to the lower fuselage, engine, and propeller.

The engine and engine accessories were examined, and all components functioned normally. No discrepancies were found with the fuel system, and the fuel and fuel screens were free of contaminants. The engine controls were properly rigged and operated normally. The reason for the loss of engine power could not be determined.

CONCLUSIONS:

Findings:
1. The engine lost power for undetermined reasons.

Causes:
The cause of the loss of engine power could not be determined.

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PIPER PA-32 CHEROKEE N33645
CRESTON, BRITISH COLUMBIA
27 AUGUST 1987

BRIEF NUMBER: 87-P70907 (Accident)
LOCAL TIME: 2350 PDT
OPERATION: Private Business
DAMAGE: Substantial
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	119	14
LAST 90 DAYS	16	14

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The aircraft was on a night visual flight rules (VFR) flight at 11,500 feet above sea level (asl) from Hillsboro, Oregon to Colville, Washington. The pilot had planned to fly direct following the 022-degree radial of the Ephrate very high frequency omnidirectional range (VOR) until it intersected the Spokane VOR 330-degree radial. This intersection would have positioned the aircraft over Colville. The pilot was unable to receive the Spokane VOR or visually identify Colville, and continued on a magnetic heading of 022 degrees. The flight arrived over Creston, British Columbia, and, as fuel was getting low, the pilot decided to attempt a landing on a lighted deserted section of highway. On final approach, the aircraft hit utility wires, causing the aircraft to pitch down and land hard on the nosewheel. The nosewheel collapsed, and the propeller, left wing, and left flap were bent. The pilot and passenger were uninjured.

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CESSNA 182 SKYLANE CF-IQI
GRAND BEND, ONTARIO
29 AUGUST 1987

REPORT NUMBER: 87-O/70065 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2015 EDT
OPERATION: Specialty Recreational Flying
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	460	120
LAST 90 DAYS	132	90

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	4

SUMMARY REPORT:

The aircraft was flying at 3,000 feet above ground level (agl) in preparation for a parachute drop. The student parachutist positioned himself on the step for his jump; as he did so, his reserve parachute opened and pulled him back off the step. The parachute went over the top of the right-hand stabilizer, and the parachutist went underneath; the stabilizer then collapsed, and the parachute lines slid off it, freeing the parachutist. The pilot was able to maintain control of the aircraft despite restricted elevator movement, and the other parachutists were able to jump from the aircraft. The pilot then made an uneventful landing.

Parachutes are packed very precisely and are rechecked several times before the parachutist exits from the aircraft. In this case, the student's parachute was checked when he put the chute on, again before he got into the aircraft, and then as the aircraft was climbing to the jump altitude.

The interior of the aircraft had been stripped of all unnecessary equipment to reduce the aircraft's weight. All seats, except the pilot's seat, had been removed, and parts of the interior upholstery, including the right front lower upholstery panel, had also been removed; this left the bottom edge of the upper door post trim uncovered and loose.

The student was sitting on the front right side of the aircraft, facing backwards. As he moved back into a position to swing out onto the step, the reserve chute lanyard snagged on the door post trim which primed the reserve chute and allowed it to open when the student stepped out into the airstream.

Marks on the reserve riser indicate that it contacted the stabilizer seven to eight inches above the student's shoulder. As the parachutist was in a crouched position with his head down at the time, he was not injured.

CONCLUSIONS:

Findings:
1. The right front lower upholstery trim panel had been removed, uncovering the bottom edge of the door post trim which was not secured.

2. In manoeuvring to the jump position, the student snagged the reserve lanyard on the door post trim which pulled the pins on his reserve parachute and allowed it to open.

3. The deployed parachute damaged the right-hand horizontal stabilizer before becoming disentangled and freeing the jumper.

Causes:
The student's reserve parachute released when its lanyard snagged on an unsecured part of the aircraft's interior trim. The prematurely released parachute damaged the right-hand horizontal stabilizer, thus restricting elevator control.

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CESSNA 172M C-GGXR
LEAMINGTON, ONTARIO 8 mi N
29 AUGUST 1987

BRIEF NUMBER: 87-O/70064 (Accident)
LOCAL TIME: 1215 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	93	35
LAST 90 DAYS	12	12

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was attempting a full-stop landing toward the south on a 2,000-foot-long private grass runway in calm wind conditions. Braking action was reduced because of wet grass, and the aircraft overran the end of the runway and collided with obstructions. When the pilot realized that he could not stop on the runway, there was insufficient runway remaining to allow a safe take-off.

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BEECH A36 BONANZA N76DW
PORT HARDY, BRITISH COLUMBIA
01 SEPTEMBER 1987

REPORT NUMBER: 87-P70908 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1450 PDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private (USA)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,430	840
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	2	-	-

HISTORY OF THE FLIGHT:

The aircraft, with the pilot and two passengers on board, departed from Port Hardy for a VFR flight to Seattle Boeing Field, Seattle, Washington, at 1447 PDT. Some pilots in the Port Hardy Airport terminal building observed the aircraft's take-off from runway 11; they noted that the aircraft used about 85 per cent of the 5,000-foot runway and that, following lift-off, the aircraft rolled and yawed from side to side before it disappeared into a heavy rain shower. Another witness, a pilot who was fishing from the shore at the far end of runway 07, observed the aircraft, as it overflew his position, in level flight at approximately 150 feet above sea level (asl). He observed the aircraft enter a right-hand turn and then disappear into the low cloud and rain. This witness reported that the weather over the water was overcast with the ceiling between 150 to 200 feet asl and the visibility two to three miles in rain and fog.

The Port Hardy Flight Service Station (FSS) tape recorded a brief and weak emergency locator transmitter (ELT) signal at 1449:30 PDT. About 1620 PDT, a fishing boat reported finding evidence of the crash floating on the water, three nautical miles east of the Port Hardy Airport.

PERTINENT INFORMATION:

The pilot, who was part-owner of the aircraft, held a valid U.S. private pilot's licence endorsed for single-en-

gine land category aircraft; he did not have an instrument rating, nor had he received any instrument training. He held a Class III medical certificate requiring him to have glasses available. The pilot had been flying since 1965 and had accumulated 1,430 hours of flying time, including 840 hours on the occurrence aircraft type. In the 90 days preceding the occurrence, the pilot had made two journeys which amounted to about 15 hours of flying time. There was no evidence of pressure on the pilot to undertake the flight.

The pilot and passengers had flown from California to Alaska for a fishing holiday and were on the return trip when the accident took place. The party's return flight to California was delayed in Ketchikan, Alaska for two days because of bad weather. On the day of the accident, following a weather briefing in which the pilot was advised that VFR flight was not recommended, the pilot filed a VFR flight plan to Paine Field, Everet, Washington, and the aircraft departed from Ketchikan at 1120 PDT. At 1349 PDT, the pilot contacted the FSS at Port Hardy, British Columbia; he requested the local weather, stated that he was quite nervous about the en route weather he had thus far encountered, and informed the FSS specialist on duty that he was going to land at Port Hardy for fuel. The pilot had some difficulty locating the airport, and, at 1406 PDT, the aircraft touched down and taxied to the fuel pumps. When the people on board disembarked, before the aircraft was refuelled, the aircraft tipped backward twice and struck its tail on the ground. The pilot received a weather briefing and filed a VFR flight plan to Seattle Boeing Field before departure.

The aircraft was not recovered after the accident, therefore, it was not possible to determine its condition at the time of the occurrence. An annual inspection of the aircraft had been carried out in August 1987, and there was no evidence of any pre-occurrence failures or malfunctions. A witness stated that the aircraft's engine was operating 'quite fine' as the aircraft overflew his position on the shore. The aircraft was equipped with two front seats and one rear-facing passenger seat behind the pilot's seat; three additional seats had been removed to provide space for personal belongings and equipment. Prior to take-off from Port Hardy, the aircraft was refuelled to capacity with 156 litres of aviation fuel.

Aircraft debris and the three victims were found floating on the water three nautical miles east of the Port Hardy Airport, just south of the extended centre line of runway 07. There the water is about 115 feet deep, and the floor of the sea is very rocky and uneven. The three occupants of the aircraft, the three seats, the rear section of the split cargo door, and 702.9 pounds of personal belongings found floating on the water were recovered. This indicated that the aircraft had broken up on impact.

A weight and balance calculation, based on the aircraft's empty weight of 2,335 pounds, plus 480 pounds of fuel, the weight of the three occupants at 551 pounds, and 702.9 pounds of personal belongings, indicated that the aircraft's take-off weight of 4,056.9 pounds exceeded the maximum allowable take-off weight of 3,600 pounds by 456.9 pounds. The centre of gravity (C of G) position, based on the probable weight distribution, was estimated to be 4.4 inches aft of the rear limit.

VFR weather conditions existed at the Port Hardy Airport at the time of the aircraft's arrival and departure. A fast-moving frontal system, however, created frequent low ceilings and reduced visibilities in rain showers, and several local pilots had stopped VFR operations because of it. The 1400 PDT weather observation was 1,000 feet scattered, ceiling estimated 4,300 feet broken, 8,500 feet overcast, and a visibility of three miles in rain showers. The observation taken after the occurrence, at 1500 PDT, was recorded as 1,000 feet scattered, measured ceiling 2,200 feet overcast, and visibility six miles in light rain showers. During the weather briefings, the pilot was informed by the briefer that the stations to the south of Port Hardy all reported good weather. Another pilot who had arrived in Port Hardy from Seattle at about the same time as the accident pilot had informed him that the en route weather to Seattle was good, except for the stretch between Port Hardy and Port McNeill where the ceiling was about 1,500 feet overcast and the visibility between one and two miles.

According to the aftercast, an intense upper trough was moving southeastward along the British Columbia coast. Its associated frontal system, positioned 50 to 60 miles to the west of Port Hardy at the time, was creating frequent stratus ceilings between 500 and 1,000 feet asl and reduced visibilities in rain showers and fog, which affected VFR flights out of Port Hardy. Because of low clouds and fog and reduced visibility in heavy rain and rain showers, several local pilots had cancelled VFR flights from Port Hardy for the day. The accident pilot had had difficulty locating the airport from one mile out, as he approached for landing.

ANALYSIS:

The fact that the pilot had difficulty locating the Port Hardy Airport from one mile out before landing confirms that the weather in the immediate vicinity of the airport was worse than reported at the airport.

During his weather briefing at Port Hardy, the pilot was informed that the stations toward the southeast all reported good weather and that the en route weather, except for a narrow stretch immediately southeast of the airport, was very good. Knowing that much better weather lay ahead and probably encouraged by the re-

port from another pilot who had recently flown through the narrow band of weather to the southeast, the pilot decided to leave Port Hardy. His intentions were probably to stay below the low clouds and maintain visual contact with the surface until clear of the weather; however, shortly after take-off, the aircraft was observed to enter the narrow band of low cloud and rain, about 150 feet above the water and in a right-hand turn. The weather was changing rapidly, and the conditions had worsened considerably since the arrival in Port Hardy of the pilot who reported suitable conditions to the southeast. Not having an instrument rating and losing visual reference shortly after take-off, the accident pilot probably became disoriented and lost control of the aircraft.

The out-of-limits C of G would have affected the aircraft's performance and stability and probably contributed to the pilot's losing control of the aircraft.

CONCLUSIONS:

Findings:

1. The aircraft's maximum allowable take-off weight and C of G limits were exceeded.

2. The aircraft's performance, stability, and controllability would have been affected by the out-of-limits C of G.

3. The weather, although better than the limits for VFR flight at the airport, deteriorated rapidly in the direction of flight shortly after take-off.

4. The pilot continued VFR flight into adverse weather conditions.

Causes:

The Canadian Aviation Safety Board determined that the pilot continued VFR flight into adverse weather conditions and most probably became disoriented and lost control of the aircraft.

BELLANCA SUPER VIKING CF-ZVG
STONY RAPIDS, SASKATCHEWAN 50 mi N
03 SEPTEMBER 1987

REPORT NUMBER: 87-C70073 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1730 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	200	60
LAST 90 DAYS	60	60

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was on a visual flight rules (VFR) flight from Rankin Inlet, Northwest Territories to Stony Rapids, Saskatchewan. The flight was uneventful until approximately half-way along the route when the weather ahead began to deteriorate. The pilot descended to maintain visual contact with the ground, but weather conditions were below VFR. The pilot eventually climbed above the cloud and circled at a position approximately 50 miles from destination, while attempting, unsuccessfully, to contact the North Battleford Flight Services Station (FSS). He was also unable to receive the non-directional beacon (NDB) at Stony Rapids. He eventually switched to the emergency frequency and received replies from pilots of high-level aircraft in the area, who relayed his intention to force-land to the appropriate air traffic control agency. With 30 minutes of fuel remaining, the pilot descended below cloud and made a forced landing in a marshy area. A Search and Rescue (SAR) aircraft found the pilot, and he was rescued by a helicopter shortly thereafter.

When the pilot checked the weather before departure, the forecast for the destination area was good VFR conditions, with local stratus and fog ceilings of 200 to 800 feet above ground level (agl), and visibilities of zero to one mile in light drizzle and fog. These local conditions were forecast to improve to good VFR weather at the time of take-off. A new forecast, issued at the time of take-off, again called for good VFR conditions but extended the period of low ceilings and visibilities by three hours. The pilot had not received the new forecast.

Communications at Stony Rapids are via a remote communications outlet to the North Battleford FSS which provides flight information service only. The specialist at the FSS did not hear the pilot's transmissions on ei-

ther the normal or emergency frequencies. The specialist subsequently discovered that the emergency receiver was unserviceable although it had been checked as serviceable when the specialists changed shift. He was able to hear transmissions from other aircraft on the normal frequencies. The Stony Rapids NDB was being used by other aircraft in the area and was reported to be serviceable throughout the occurrence. The reason for these discrepancies could not be determined.

The pilot took off at the same time a new weather forecast was issued and thus was not aware that low ceilings and visibilities were forecast along the route. When bad weather was encountered and the pilot was unable to receive the NDB at destination or establish contact with the FSS, he carried out a precautionary landing because his fuel was running low. It was not determined why the pilot was unable to contact the FSS.

CONCLUSIONS:

Findings:

1. The pilot encountered poor weather conditions which forced him to climb on top of cloud.

2. The pilot was unable to establish his position, and, because the fuel quantity was low, he carried out a precautionary landing.

3. The weather encountered by the pilot was considerably worse than forecast.

4. The pilot was unable to establish radio contact with the North Battleford FSS and could not receive the Stony Rapids NDB.

5. The FSS emergency receiver was unserviceable.

6. It was not determined why the pilot was unable to contact the FSS.

Causes:

After encountering weather much worse than forecast, the pilot was unable to establish his position and, with fuel running out, carried out a precautionary landing.

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CESSNA 170B C-FPCS
CALGARY INTERNATIONAL AIRPORT, ALBERTA
05 SEPTEMBER 1987

BRIEF NUMBER: 87-W70058 (Accident)
LOCAL TIME: 1000 MST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	115	3
LAST 90 DAYS	N/A	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was taking off in his recently purchased aircraft. At about 45 mph, he raised the tail, and the aircraft drifted to the left. The pilot applied rudder but could not regain control, and the aircraft ground looped to the left. The left wing tip struck the runway, and the left landing gear was damaged. The wind was calm.

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CESSNA 421 GOLDEN EAGLE N3125K
KASKATTAMA RIVER, MANITOBA
09 SEPTEMBER 1987

REPORT NUMBER: 87-C70907 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1430 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,200	700
LAST 90 DAYS	75	75

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

SUMMARY REPORT:

The pilot began the take-off from the sandy strip for a flight to Gillam, Manitoba. The aircraft had travelled only a short distance when it ran off the edge of the runway, and the right main wheel sank into soft ground. The aircraft swung about 90 degrees to the right, and,

during the swing and subsequent skid, both main gear legs failed; the aircraft came to rest on the nosewheel and fuselage.

Several of the barrels used as runway markers had been moved outward from the runway edge on the west side of the strip, and fog had reduced the visibility to between one-quarter and one-half mile. Because of the displaced runway markers and the poor visibility, the pilot misaligned the aircraft with the runway. When the aircraft's right main gear sank into soft ground beside the strip, the pilot lost directional control.

CONCLUSIONS:

Findings:
1. The visibility was less than that required for take-off.

2. The displaced runway markers did not accurately mark the serviceable width of the runway.

3. The pilot lost directional control when the aircraft rolled onto soft ground.

Causes:
The displaced runway markers and the poor visibility caused the pilot to misalign the aircraft with the runway during the take-off roll.

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CESSNA R172K (HAWK XPII) C-GGAO
SIOUX LOOKOUT, ONTARIO
11 SEPTEMBER 1987

REPORT NUMBER: 87-C70074 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: Unknown
OPERATION: Private Company Business
DAMAGE: Unknown
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	330	300
LAST 90 DAYS	60	50

Injuries:	Fatal	Missing*	Serious	Minor/None
Crew	-	1	-	-
Passengers	-	1	-	-

* Presumed Fatal

SUMMARY REPORT:

The pilot flew from Thunder Bay to Sioux Lookout, Ontario, in the late afternoon with a company mechanic as a passenger, who was to repair a customer's logging machine. On completion of the work, they returned to the airport and departed shortly after 2300 eastern daylight time (EDT) on the return flight to Thunder Bay. The aircraft was not seen or heard from again. A search was initiated, but neither the aircraft nor the two occupants were found.

The pilot filed a visual flight rules (VFR) flight plan for the 1 hour and 20 minute flight to Thunder Bay. He had checked the weather, which was forecast to be generally good, with isolated stratus clouds and isolated reduced visibilities. Temperature and humidity conditions were conducive to the development of fog, but none was reported at the departure or destination points during the projected period of the flight. Satellite imagery showed cloud between Sioux Lookout and Thunder Bay at the time of the flight. A medical evacuation flight left Ignace, Ontario for Thunder Bay less than an hour after the missing aircraft had left Sioux Lookout, and the pilot of this flight stated that there was low-level cloud along his route, from about 20 nautical miles southeast of Ignace to a point about 50 nautical miles from Thunder Bay.

The aircraft technical records were examined, and no discrepancies were found. The aircraft had been refuelled at Sioux Lookout, and samples taken from the fuel supply during the investigation were free of contaminants. Four other aircraft had been refuelled from the same source and subsequently operated without any problems.

The pilot was reported to be a careful and thorough individual who had had considerable instrument training, although he had not obtained an instrument rating. He had been awake for about 15 hours at the time of departure and had not eaten an evening meal.

The evidence collected did not reveal the reason for the disappearance of the aircraft and its occupants.

CONCLUSIONS:

Findings:
1. The aircraft disappeared en route and has not been located.

2. There is no evidence to indicate why the aircraft disappeared.

Causes:
Undetermined.

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FOREST PATROL LIMITED
ROCKWELL THRUSH COMMANDER CF-ZTE
ST. LEONARD, NEW BRUNSWICK 12 mi E
15 SEPTEMBER 1987

BRIEF NUMBER: 87-A70032 (Accident)
LOCAL TIME: 0815 ADT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,650	1,200
LAST 90 DAYS	125	125

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The aircraft was being used to apply herbicide to a spruce tree plantation when, during a spray run, the engine (Pratt & Whitney R1340-AN1) started to run rough. The pilot noticed smoke coming from the engine, and he dumped the load of herbicide in an attempt to maintain altitude. The pilot reduced power, but the engine vibration became worse, and oil started to run along the left side of the fuselage. The pilot force-landed on a woodlot road; during the landing roll, the left wing struck low brush at the edge of the road, and the aircraft swung left into a ditch. The aircraft sustained damage to the wing tips and tail wheel assembly.

An examination of the engine showed that the connecting rod for the number seven piston was broken at the crankshaft end.

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BIG NINE OUTFITTERS LTD.
PIPER PA-18-150 C-GNTW
GATHO CREEK, BRITISH COLUMBIA
29 SEPTEMBER 1987

REPORT NUMBER: 87-P70080 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1050 PDT
OPERATION: Private Recreational
DAMAGE: Minor
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	700	500
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1
OTHER	-	1	-

SUMMARY REPORT:

The aircraft was on final approach for landing when the pilot saw a hunter to the left of the airstrip, filming the approach. The pilot noted that the hunter was clear of the landing area and continued with the landing. Shortly after touchdown, the aircraft's left wing tip struck the hunter as he was filming, seriously injuring him.

The hunting camp landing strip was short and rough and only wide enough for the aircraft's landing gear; therefore, the pilot had to concentrate on keeping the aircraft on the strip.

The hunter was using a video camera, and objects seen through the view finder were reduced in size, which the hunter perceived as an increase in the distance between himself and the object viewed. For this reason, as the hunter walked toward the runway looking through the camera's view finder, he did not realize that he was walking into the path of the approaching aircraft. On final approach, the pilot, having noted that the hunter was clear of the runway, concentrated on the landing, and he did not notice that the hunter had walked onto the airstrip.

CONCLUSIONS:

Findings:
1. The hunting camp airstrip was narrow and required the pilot's total concentration during landing.

2. The viewfinder of the camera made objects seem further away than they were, and the hunter misjudged his distance from the airstrip.

3. The hunter moved onto the runway as he filmed the aircraft's approach and landing.

Causes:
A photographer, on the ground, failed to maintain safe distance from the active landing area.

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CHAMPION 7ECA CITABRIA C-GEKQ
NEWDALE, MANITOBA 4 mi SW
22 SEPTEMBER 1987

BRIEF NUMBER: 87-C74081 (Incident)
LOCAL TIME: 1915 CDT
OPERATION: Private Recreational
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6,350	85
LAST 90 DAYS	45	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

Following a normal touchdown on a rough farm strip, the aircraft began to pull to the right. Shortly thereafter, the right gear collapsed, causing minor damage. At the time of the incident, the aircraft was at low speed.

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CESSNA 175 C-FLBU
ROLAND, MANITOBA 3 mi N
26 SEPTEMBER 1987

REPORT NUMBER: 87-C70079 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2030 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	185	7
LAST 90 DAYS	27	7

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	4	1

SUMMARY REPORT:

The pilot, with five passengers on board the aircraft, arrived over his farm after a short visual flight rules (VFR) flight from Morden, Manitoba. Even though it was quite dark, his intention was to land on his unlighted farm strip. He flew along the strip at about 1,000 feet above ground level (agl) and, after identifying a road adjacent to his property, circled to the left and descended to about 500 feet agl. He turned onto final approach, and, when he saw what he thought were his house lights, the pilot descended further, without reference to his altimeter. He estimated his altitude to be about 250 feet agl and noted that, after the descent, it seemed to be darker than it was at the higher altitude and realized that a landing was impossible. He initiated an overshoot with the intention of proceeding to a lighted airport nearby. Almost immediately, the aircraft wheels touched on a grid road; the aircraft travelled about 35 feet to where the right wing struck a telephone pole. The aircraft came to rest 125 feet from where it stuck the pole.

The pilot's wife, seated beside him, was holding their four-year old son on her lap. Three daughters in the rear seat were restrained by two lap belts, the two youngest shared one belt, the eldest used the remaining seat-belt. There were no shoulder harnesses installed in the aircraft. The pilot had obtained a night endorsement 14 months prior to this occurrence. He had not logged any night time since obtaining that endorsement.

The pilot was flying the aircraft on a dark night without reference to his altimeter. He unknowingly allowed the aircraft to descend to an altitude that did not provide obstacle clearance, and the right wing struck a telephone pole. Three of the four passengers were not restrained in the approved manner.

CONCLUSIONS:

Findings:
1. The pilot attempted night flight at low level without reference to his altimeter.

2. The aircraft was allowed to descend to an altitude that did not provide obstacle clearance, and it struck a telephone pole.

3. Three of the passengers were not restrained in an approved manner.

Causes:
The pilot attempted a landing to an unlit airstrip.

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PIPER PA-34-200T SENECA II C-GVKO
EAGLE LAKE, ONTARIO
26 SEPTEMBER 1987

REPORT NUMBER: 87-O/70072 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1445 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,000	300
LAST 90 DAYS	70	35

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

SUMMARY REPORT:

The pilot with three passengers on board departed from Toronto/Buttonville Airport on an instrument flight rules (IFR) flight to a private airstrip at Eagle Lake, Ontario, to visit friends at a cottage located at the airstrip. As the aircraft neared destination, the pilot cancelled his IFR clearance and proceeded to the airstrip, in accordance with visual flight rules (VFR). When he saw the airstrip, the pilot circled the area and decided to land toward the east with a tail wind of 15 knots gusting to 25. The aircraft touched down approximately 700 feet beyond the runway threshold and, on roll-out, overran the end of the runway onto rough ground where the landing gear collapsed, and the aircraft collided with tree stumps.

The aircraft was at the manufacturer's maximum landing weight of 4,342 pounds. There were no aircraft systems or component failures that contributed to the cause of the accident.

The pilot elected to land with a tail wind because the east/west oriented 1,600-foot gravel runway has high terrain to the east of it. He flew the approach at an airspeed of 80 knots with full flap extended.

The landing roll on a dry, paved surface, assuming a full-stall landing, would have been approximately 1,900 feet. As the total runway length was 1,600 feet and there was only 900 feet of runway remaining after touchdown, it was concluded that the runway was too short for the pilot to carry out a successful landing with this type aircraft.

CONCLUSIONS:

Findings:

1. High terrain off the east end of the runway prevented the pilot from landing into wind.

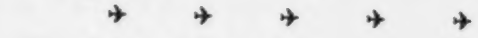
2. The aircraft approached and landed with a strong tail wind component.

3. The aircraft overran the runway on landing.

4. The aircraft crossed rough, uneven terrain and collided with tree stumps off the end of the runway.

Causes:

The landing was attempted on a runway of insufficient length for the operation of this type aircraft.



CESSNA C182 CF-WTS
QUILCHENA AIRPORT, BRITISH COLUMBIA
27 SEPTEMBER 1987

BRIEF NUMBER: 87-P70083 (Accident)
LOCAL TIME: 1620 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,500	800
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was on a pleasure flight from Kamloops, British Columbia to Langley, British Columbia. En route, he decided to land at the Quilchena Airstrip for a short stop. Just before touchdown, he observed an obstacle on the runway. He veered to the left to avoid the obstacle, and the left wing struck a dirt bank, damaging the wing tip. The nosewheel collapsed, and the propeller, the lower cowling, and the right wing were damaged.

The pilot had touched down on the old part of the runway, which was not aligned with the newer runway. The obstacle that he veered to avoid was the threshold marker for the new section.

The landing was being carried out into the afternoon sun which made it difficult for the pilot to see the landing area clearly.

CESSNA 172 CF-KHO
WYOMING, ONTARIO
27 SEPTEMBER 1987

BRIEF NUMBER: 87-O/70071 (Accident)
LOCAL TIME: 0910 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private Pilot

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	350	200
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

During the landing ground roll, the pilot applied the brakes and found that the wheels skidded on the wet, grassy surface of the runway. The flaps were raised to increase the weight on the wheels which continued to skid. With the end of the runway approaching, the pilot ground looped the aircraft to the left. The aircraft slid sideways until the right tire contacted a bare spot on the runway, and the right wing pitched down and struck the surface.

The pilot reported that light rain and drizzle were falling. Following the accident, the pilot found that a slight tail wind condition had existed which was not indicated by the wet wind sock. The pilot reported that the runway used sloped downhill in the direction of landing.

CESSNA 180 SKYWAGON CF-IYI
EAGLE PLAINS, YUKON TERRITORIES
01 OCTOBER 1987

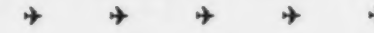
BRIEF NUMBER: 87-W70066 (Accident)
LOCAL TIME: 1300 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,000	3,000
LAST 90 DAYS	150	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot landed on a highway, and the aircraft slid on a patch of ice. The aircraft yawed sideways, and the tail swung into a ditch. The left landing gear leg folded under the aircraft, resulting in damage to the left wing.



WILGA 80 C-GFOM
CHRISTINA FALLS, BRITISH COLUMBIA 10 mi W
02 OCTOBER 1987

BRIEF NUMBER: 87-P70085 (Accident)
LOCAL TIME: 0830 PDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,150	600
LAST 90 DAYS	83	83

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

On touchdown, in moderate cross-wind conditions, a gust lifted the aircraft's left wing. The pilot applied aileron but was unable to arrest the aircraft's motion. The right wing tip contacted the ground, and the aircraft swung off the right side of the runway into willows. The aircraft came to rest upside down and was substantially damaged. The pilot and passenger were uninjured.

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CESSNA 172H CF-YQT
ELROSE, SASKATCHEWAN
04 OCTOBER 1987

BRIEF NUMBER: 87-C70080 (Accident)
LOCAL TIME: 1140 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	122	60
LAST 90 DAYS	28	28

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

During the early stages of the take-off roll, the aircraft began to drift with the wind, and the pilot closed the throttle to reject the take-off. The aircraft immediately turned into wind, then rotated forward. The propeller and left wing struck the runway and were damaged.

The wind was from about 40 degrees off the runway heading, blowing at 20 to 30 mph with gusts.

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AERONCA 7AC C-FDUY
GORE BAY, ONTARIO 14 mi S
10 OCTOBER 1987

REPORT NUMBER: 87-O/70078
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1545 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	195	15
LAST 90 DAYS	2	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	1

HISTORY OF THE FLIGHT:

The pilot departed from the Manitowaning Airport at approximately 1500 eastern daylight time (EDT) and, after a short flight in the local area, proceeded to the private airstrip where he carried out three unsuccessful attempts to land on the runway. After the third landing attempt, the aircraft proceeded south of the airstrip at low altitude and then entered a shallow, right descending turn and struck the trees; there was no change in sound from the aircraft engine until after the aircraft had collided with the trees.

The aircraft was flown by the pilot/owner who intended to land the aircraft at the private airstrip where a maintenance engineer was to carry out the annual Condition and Conformity Inspection on the aircraft. Prior to the flight, the pilot contacted the engineer by telephone and ascertained that the runway surface conditions were suitable for him to land his aircraft.

PERTINENT INFORMATION:

The airstrip is an open field approximately 1,500 feet long by 300 feet wide, oriented in a north/south direction, with the north end of the field bordered by trees. The south end has a hangar located along the west edge and is bordered by utility wires. The field surface at the time of the occurrence was generally level and firm, with grain stubble three to four inches high. The airstrip was not equipped with a wind direction indicator or wind sock at the time of the occurrence.

The 2000 Coordinated Universal Time (UTC) (1600 EDT) weather observation taken at Gore Bay, 14 miles to the north, was cloud 2,000 feet scattered, estimated 3,000 feet broken, 12,000 feet broken, with the visibility 15 miles. The wind was from 300 degrees magnetic at 10 knots with the temperature at seven degrees Celsius and the dew point at two degrees Celsius.

The pilot was a 39-year-old man who flew for recreational purposes. When the pilot first applied for his student pilot permit in 1975, his first medical examination assessed him as 'unfit' because the electrocardiogram (ECG) showed conduction defect Wolf Parkinson White (WPW). At the time, Civil Aviation Medicine assessed all pilots with WPW as unfit. Nevertheless, he went ahead and had a full cardiovascular work-up done by a heart specialist, and this included coronary arteriography, which revealed normal coronary arteries.

In 1976, following a cardiological conference in Ottawa, at Civil Aviation Medical Headquarters, it was decided to allow people with WPW pattern to fly, as long as they did not show any signs of abnormal heart rhythms. On this basis, the pilot was reassessed as fit in 1976 and

commenced flight training in 1977. Subsequent medical examination reports were normal, and, as he was under 40, no subsequent ECGs were required.

In April of 1987, he was attended to by a medical doctor at the Manitoulin Health Centre when he went there complaining of some chest pain and coughing up blood. The ECG done at this time showed some ST-segment changes which concerned the doctor, and arrangements were made for him to be evaluated by a cardiologist. In August 1987, he was seen by the same heart specialist who had seen him 12 years previously, and it became apparent that he had some serious problems, as he became breathless on exertion. An exercise ECG done by the heart specialist showed ST-segment depression which was difficult to interpret because of the concurrent WPW pattern, and arrangements for him to have a repeat coronary angiogram were made. This had not been carried out by the time of the accident.

On the morning of 10 October 1987, the day of the accident, the pilot complained of some chest pain to his daughter while he was hand-propping his aircraft. During the approach to the landing, the pilot's daughter, who was seated behind her father, cautioned him that she thought they were too low but got no response from him before the aircraft descended into the trees.

The main autopsy findings on the pilot were severe three-vessel coronary artery disease, evidence of an old myocardial infarction (heart attack), and some very minor superficial lacerations and bruises. The pathologist's opinion as to the cause of death was abnormal heart rhythm secondary to coronary artery disease, and an old myocardial infarction.

At the time of the accident, the pilot was in possession of a current Licence Validation Certificate, signed by a medical examiner. He had undergone a medical examination from an aviation medical examiner on 05 October 1987, five days prior to the accident. The completed Civil Aviation Medical Examination Report indicated a denial by the pilot of any heart disease or chest pain, and the medical examination did not detect any problems. Consequently, the medical examiner signed the Licence Validation Ceritificate "fit" to exercise the privileges of the pilot's licence.

There was no mechanical failure or malfunction of the aircraft or components that would have contributed to the cause of the accident; the aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

ANALYSIS:

The pilot was not able to land the aircraft successfully on three approaches carried out in a southerly direction. The wind at the airstrip was reported by a witness to have been from the northwest at approximately 10 knots, which would have increased the aircraft's ground speed on approach because of the downwind component. This added ground speed, combined with the trees on the approach at the north end of the short field, probably caused the pilot to overshoot the runway on all three attempts to land.

It could not be determined how the pilot assessed the wind speed or direction since there was no wind direction indicator at the private airstrip.

Medical evidence and the autopsy reports indicated the pilot was not in good health. Since April 1987 he had been suffering from chest pains and shortness of breath and had been seeking medical help. The abnormal heart rhythm resulting from the pilot's heart condition incapacitated the pilot causing him to lose control of the aircraft, and it descended into the trees.

CONCLUSIONS:

Findings:

1. The pilot overshot the runway after the third unsuccessful attempt to land the aircraft.

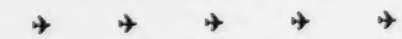
2. The landing was attempted with a tail wind on a 1,500-foot clearing bordered at both ends by obstructions.

3. The pilot became incapacitated because of abnormal heart rhythm, and the aircraft descended uncontrolled into trees.

4. The pilot suffered from heart disease. The pilot did not disclose his known heart condition on his recent Civil Aviation Medical Examination Report, nor was his heart condition detected during the medical examination.

Causes:

After the pilot became incapacitated because of abnormal heart rhythm, the aircraft entered a shallow, uncontrolled descent into trees.



PIPER J4A C-FYIZ
HIGH RIVER, ALBERTA 10 mi W
11 OCTOBER 1987

BRIEF NUMBER: 87-W70069 (Accident)
LOCAL TIME: 1515 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,300	2
LAST 90 DAYS	100	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The owner of the Piper J4A had offered his friend the opportunity to fly his 47-year-old aircraft. The pilot completed a short local flight and carried out a normal approach and landing on the farm strip. During the roll-out, the aircraft suddenly nosed over, resulting in structural damage to the fin and rudder.

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CESSNA 210 CENTURION C-GAMR
DUNCAN AIRPORT, BRITISH COLUMBIA
11 OCTOBER 1987

BRIEF NUMBER: 87-P70090 (Accident)
LOCAL TIME: 1510 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	578	46
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The aircraft's battery was in a low state of charge, and the starter would not turn the engine through the compression stroke. The pilot pulled the propeller through the compression stroke by hand before engaging the starter again. When the engine did not start, he got out to repeat the procedure. However, as he moved the propeller, the engine started, and, before he could reach inside the cockpit, the aircraft moved forward, crossed the runway, and ran into trees where it was extensively damaged.

The pilot had not pulled the mixture control fully to the idle cut-off position, nor had he turned the ignition switch to the full-off position.

The aircraft had not been tied down.

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NORTH AMERICAN AVIATION
NA64 YALE CF-AAY
FERGUS, ONTARIO 5 mi NE
18 OCTOBER 1987

REPORT NUMBER: 87-O/70082
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1710 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:

	FRONT-SEAT PILOT		REAR-SEAT PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	555	4	12,000+	0
LAST 90 DAYS	13	4	N/A	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	2	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

At approximately 1710 eastern daylight time (EDT), the aircraft was observed in a low, fast fly-by of the owner's airstrip; there was no apparent attempt to land. After flying the length of the airstrip, at about 50 feet above ground, the aircraft started a sharp pull-up. It was climbing steeply when it suddenly dropped, rotated about 90 degrees to the right, and crashed in a field. Both occupants sustained fatal injuries as a result of the impact. A post-crash fire destroyed the cockpit section of the aircraft.

PERTINENT INFORMATION:

The aircraft departed from the Guelph Air Park at approximately 1630 EDT on Sunday, 18 October 1987. The owner of the aircraft was in the front seat, and a

qualified pilot was in the rear seat. The purpose of the flight was to build time for the aircraft owner and allow him to become familiar with the aircraft prior to his flying solo, and also to introduce the rear-seat pilot to the aircraft.

The pilot in the front seat was a part owner of the aircraft although his private pilot licence was not type-endorsed for the Yale. He had been involved in the restoration of the aircraft and was keen to fly it. The owners of the aircraft had made arrangements with a local commercial pilot to test fly the aircraft, and the pilot had received some training in the Yale from the commercial pilot (instructor). Although the pilot had recorded 4.8 hours of training in his private pilot's log book, the training was reported as progressing slowly; the majority of the pilot's experience was in much smaller aircraft, such as Pitts Special, Citabria and J-3 Cub, and the instructor had other duties and was not always available. The instructor reported that the pilot was not ready to fly the aircraft solo as he had some trouble controlling it on the ground and was not comfortable with the stall/spin characteristics of the aircraft. The pilot also reported to others that he respected the aircraft and, at times, referred to it as "the Beast." He had said that slow flight scared him because the aircraft would stall and go into an incipient right spin with no warning at all. The pilot's previous flying experience included considerable aerobatic training, and, in 1978, he was an intermediate aerobatic champion.

At one point in the training, the pilot had asked the instructor to demonstrate a "zoomie" (high-speed, very low-level fly-past with a sharp pull-up) at the pilot's airstrip. This request was denied, and a simulated landing approach with a normal overshoot was demonstrated instead.

The pilot had recorded 2.9 hours of flight training in his private pilot's log book that was not recorded in the aircraft's journey log book.

The pilot in the rear seat was a licensed airline transport pilot who was endorsed to fly all aircraft having a maximum gross weight of 12,500 pounds or less. He had considerable flying experience in a large number of different aircraft; however, he had never flown in the Yale. He had recently taken four hours of instruction in a Harvard MK2 and was ready to fly solo in it. The general view of his peers was that he was a conscientious and safe pilot, and this was reflected in positive comments on his training reports.

The aircraft was manufactured on 14 May 1940 as a World War II combat trainer and had recently been completely rebuilt in a meticulous manner by the front-seat pilot and two other part owners of the aircraft. The aircraft was test flown on 24 August 1987, and, at the time of the accident, a total of 3.6 hours of flying was recorded in the aircraft journey log book. There were no reported snags on the aircraft.

The aircraft struck the ground in a nose-low attitude with little forward airspeed and did not skid or bounce. It was determined that the engine was producing considerable power at the time of the crash. The cockpit area was destroyed by a post-crash fire which was fed by fuel from the aircraft fuel tanks. It was impossible to establish complete control continuity or control selections other than that the wing flaps were at zero degrees and the cockpit canopy was closed. No obvious discrepancies were found.

The weather at the time of the accident was suitable for visual flight rules (VFR) flight. There was a 90-degree cross-wind from the southwest at about 10 knots.

ANALYSIS:

The aircraft had been flown for four hours with no major snags.

The purpose of the flight was to practise some air work on the Yale, but it was not determined what manoeuvres were practised or which pilot was flying the aircraft.

The aircraft did not bounce or skip at impact, indicating that it had little forward airspeed at the time. The sharp pull-up and subsequent drop are indicative of an aircraft stall, probably as a result of mishandling of the controls and unfamiliarity with the aircraft.

Because of the low altitude, the pilots did not have time to effect a recovery before ground impact.

CONCLUSIONS:

Findings:

1. The aircraft stalled and crashed.

2. A post-crash fire destroyed the cockpit area of the aircraft.

3. There was no determination as to which pilot was flying the aircraft.

4. The front-seat pilot was not type-endorsed for this aircraft.

5. The rear-seat pilot was licensed and qualified to fly the aircraft but had no experience in this aircraft type.

Causes:
The Canadian Aviation Safety Board determined that the aircraft was inadvertently stalled, probably because of the pilot's unfamiliarity with the aircraft.

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PIPER PA-22-150 PACER C-FMHO
LUNDAR, MANITOBA 5 mi SW
25 OCTOBER 1987

REPORT NUMBER: 87-C70085 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1030 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,400	10
LAST 90 DAYS	40	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot took off for a local pleasure flight from his farm strip. The aircraft was at 200 feet above ground level when the engine began to sputter and lose power rapidly. The pilot decided to land into wind on a nearby road, but, on the approach, the aircraft struck a power line and crashed into a ditch.

The engine and fuel system were examined after the accident; no faults were found, and the fuel was not contaminated. During the ground run prior to take-off, the pilot checked that the carburettor heat system was working, then took off with it in the COLD position. The pilot did not apply carburettor heat when the engine lost power.

At the time of the accident, the temperture was near freezing and atmospheric conditions were conducive to carburettor icing. The engine lost power because of carburettor icing, and carburettor heat was not applied to correct the situation.

CONCLUSIONS:

Findings:
1. The engine lost power because of carburettor icing.

2. Carburettor heat was not applied following the loss of power.

3. The loss of power resulted in a forced landing, and the aircraft struck a power line during the approach.

Causes:
The engine lost power because of carburettor icing. During the ensuing forced landing, the aircraft struck a power line and crashed.

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PIPER CHEROKEE TURBO ARROW III
PA-28R-201T N47338
CORNWALL AIRPORT, ONTARIO
25 OCTOBER 1987

REPORT NUMBER: 87-O/70904
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2215 EDT
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Commercial (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	900	90
LAST 90 DAYS	180	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The aircraft departed Meadville, Pennsylvania for Massena, New York and flew at 9,500 feet under visual flight rules (VFR) navigating by Loran C. Near Massena, the engine began to run rough, and the pilot descended to what he thought was Massena Airport but found it in darkness, except for the rotating beacon. After circling the airport several times, the pilot elected to land in an area in the vicinity of the airport, which he thought was probably the runway. The pilot selected the gear down and landed in a grass-covered field located along the southern edge of the airport property. During the touchdown, all three landing gear legs collapsed, and the aircraft slid for 305 feet before coming to a stop on its belly.

PERTINENT INFORMATION:

Earlier in the day, the pilot, accompanied by a passenger, departed Austin, Texas, at approximately 0830

eastern daylight time (EDT), on the first leg of a ferry flight to Holland.

The first stop was Witchita Falls, Texas, where the aircraft was refuelled to capacity, including the ferry tank, a 45 U.S. gallon drum placed on the rear seats. The fuel from the ferry tank was transferred by the pilot, as it was required, to the right wing tank. The aircraft departed from Witchita Falls at approximately 1115 EDT, climbed to 11,500 feet, and flew directly to Meadville, Pennsylvania, landing at approximately 1900 EDT. The pilot reported that, when the aircraft was 10 to 15 miles from Meadville, the engine had begun to run rough but had cleared up after 10 or 15 seconds when he switched from the right to the left fuel tank and turned on the auxiliary fuel pump. After deplaning his passenger at Meadville, the pilot carried out a full run-up, including switching tanks; during the run-up, the engine operated satisfactorily, and the pilot took off for Massena, New York, where he was to refuel and clear customs before proceeding to Moncton, New Brunswick.

The aircraft arrived over the Massena very high frequency omnidirectional beacon (VOR) at an altitude of 9,500 feet in darkness at approximately 2000 EDT. The Loran C navigational equipment at that time indicated that Massena Airport was on a heading of 023 degrees magnetic at a distance of 20 nautical miles. At this point, the engine began to run rough again, and the pilot started to descend toward the airport. Arriving over what he thought was Massena Airport, the pilot could see a rotating beacon but no runway lights. The pilot circled the airport several times; during this time, the engine was still running rough, and the pilot was switching tanks and operating the boost pump. Unsuccessful in his effort to restore full power, the pilot decided to land in the dark, hoping he would be able to find the runway. The pilot selected the gear down and landed in a dark area which turned out to be a grass field adjacent to the southern edge of the airport property.

The wing tanks in this aircraft hold a total of 77 U.S. gallons, of which five U.S. gallons are unusable. Including the 45-gallon ferry tank, there was a total of 117 U.S. gallons of usable fuel on board the aircraft when it departed Witchita Falls.

Following the accident, the remaining fuel was drained out and measured. One-half U.S. gallon was drained from the left wing tank, and 7.9 U.S. gallons of fuel were removed from the right wing tank; the ferry tank was empty. Both fuel gauges were found to read accurately, the left one indicating empty, and the right indicating about eight U.S. gallons. There was no indicator installed on the ferry tank. The fuel selector in the cabin was found in the left tank position. Examination of the fuel system did not reveal any faults which would have resulted in the erratic running of the engine. The engine rotated freely, and all six cylinders had compression. The metered fuel line, running from the metering unit to the flow distributor, was found to be empty.

Each wing tank has an unusable fuel volume of two and one-half U.S. gallons, and two of these unusable gallons had been used from the left wing tank. When the fuel quantity falls below the usable level, air is introduced into the system, which would have caused the erratic operation of the engine reported by the pilot.

In this aircraft, the ferry tank was fed into the right wing tank; the instructions for transferring fuel from the ferry tank were to use the fuel from the right tank then switch to the left tank and refill the right tank from the ferry tank; after the right tank was refilled, the procedure was to switch the ferry tank off and switch back to the right tank. Earlier in the day, the same engine problem had occurred as the aircraft approached Meadville, and it had been quickly rectified by switching tanks and turning on the fuel boost pump. The aircraft at that time, however, had more usable fuel on board.

Although there were approximately 5.3 U.S. gallons of usable fuel in the right wing tank after the accident, it could not be determined if this fuel was available to the engine at the time of the reported malfunction or if it had been transferred into the right wing tank from the ferry tank after the accident. The pilot thought the ferry tank still contained about 10 or 11 gallons following the occurrence. He stated that, during the last few minutes of the flight, he had the ferry tank selected on, but the engine continued to run rough; he had continued to switch from left to right tanks and apply the boost pump, and the engine performance had improved slightly.

The quantity of usable fuel found in the aircraft after the accident was in accordance with a fuel consumption figure of 11 U.S. gallons per hour as used by the pilot, plus extra for taxiing and run-ups.

The Massena Airport is located 20 nautical miles southwest of the Cornwall Regional Airport. The Massena VOR is located 5.1 nautical miles southeast of the Massena Airport. When the aircraft was over the Massena VOR, the pilot reported that his Loran C indicator showed the Massena Airport to be 20 nautical miles away, on a heading of 023 degrees true. The pilot had mistakenly programmed his Loran C for the Cornwall Regional Airport rather than Massena.

Massena Airport at the time of the incident was open, and the runway lights were on. The night was clear, and the pilot had passed quite close to the Massena Airport but had not recognize it because of the erroneous heading his Loran C had given him. Another pilot, who was on approach to Massena and about five to eight miles

from the airport, heard the pilot of the occurrence aircraft transmitting on 122.9 megahertz (MHz) reporting that he was five miles north of Massena with a malfunctioning engine and that he was descending from 6,000 feet and could not see the lights of the airport. The other pilot also stated that he could not see the occurrence aircraft. After approximately five minutes, this pilot called Montreal Centre and was told that there was a weak image on the radar over Cornwall. He asked for the frequency of Cornwall Airport and keyed his microphone on 123.4 MHz which turned on the runway lights at Cornwall; however, the occurrence aircraft had landed about one minute earlier.

The pilot had started duty at 0730 EDT on the morning of the occurrence and, at the time of the accident, had been on duty for nearly 15 hours, 10 of which had been in the air.

ANALYSIS:

The pilot had passed by the lighted runway of the Massena Airport, but he did not identify it as such because his Loran C equipment had been incorrectly programmed for Cornwall and was indicating that Massena was 20 miles northeast.

While near the Massena VOR, the engine began to run rough when the fuel level in the wing tanks dropped below the usable level, and air entered the fuel system. Although some usable fuel was remaining in the ferry tank, the pilot did not attempt to use this until the last few minutes of flight when the aircraft was about to land. The effects of fatigue on the pilot may have resulted in errors in fuel management toward the end of the flight as there was some usable fuel was on board the aircraft at the time of the accident.

It could not be determined exactly when this usable fuel was transferred from the ferry tank to the right tank, but, according to the pilot, it was transferred in the last few minutes of the flight. At this time, the engine was being fed from the left tank which was well below the usable level, resulting in the erratic engine performance reported by the pilot. The pilot decided to make a precautionary landing while some engine power remained.

CONCLUSIONS:

Findings:
1. The pilot had incorrectly programmed his Loran C navigational equipment.

2. The pilot did not notice this programming error when he overflew his destination.

3. The volume of fuel in the aircraft's tanks had dropped below the usable level which caused air to enter the fuel system and resulted in the engine running rough.

4. The runway lights at Cornwall airport were off, and the pilot could not see the runway.

5. The pilot carried out a precautionary landing in a field adjacent to the airport.

6. The pilot was probably in a state of fatigue, which may have affected his management of the fuel and navigation when nearing the end of his flight.

Causes:
The pilot did not properly use the aircraft's navigational equipment and mismanaged the fuel.

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CESSNA 150L C-GYIR
BENGOUGH, SASKATCHEWAN
25 OCTOBER 1987

BRIEF NUMBER: 87-C70084 (Accident)
LOCAL TIME: 2015 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	195	100
LAST 90 DAYS	124	100

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot was conducting a night visual flight rules (VFR) flight from Willow Bunch to Regina, Saskatchewan. The pilot checked the weather and noted that rain showers were forecast but after his planned arrival time.

Approaching Regina, the pilot noted rain showers in the area. He decided to proceed to an alternate airport but was soon surrounded by rain showers, causing ground lights to fade from his sight. The pilot eventually saw the lights of a town and a highway leading to it. He decided to land on the highway which was perpendicular to the direction of the strong wind.

After touchdown, directional control was lost, and the aircraft left the road and entered a ditch. The left wing then struck a hydro pole, and the aircraft came to rest on

its nose. After the occupants had evacuated the aircraft, a gust of wind flipped the aircraft over.

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ERCOUPE 415D C-FFZV
ST. CATHARINES, ONTARIO 10 mi S
25 OCTOBER 1987

BRIEF NUMBER: 87-O/70084 (Accident)
LOCAL TIME: 1120 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private Pilot

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,300	10
LAST 90 DAYS	1	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was flying at 2,000 feet when the engine (Teledyne Continental C85-12F) began to sputter. Carburettor heat and full throttle were applied, but the engine failed to respond. The pilot shut off the fuel and ignition and force-landed on a country road. Just prior to touchdown, a gust of wind caused the aircraft to drift to the right, and the right wing tip contacted the branches of trees along the side of the road. The aircraft swerved to the right and rolled down an embankment, coming to rest near the bottom in a nose-down position.

The pilot made no attempt to restart the engine and believed carburettor ice may have been the cause of the loss of power. At the time of the accident, the temperature was seven degrees Celsius and dew point minus two degrees Celsius which would be conducive to the formation of carburettor ice.

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PIPER PA-18 SUPER CUB C-GXCR
RICHARDSON, SASKATCHEWAN 7 mi S
28 OCTOBER 1987

REPORT NUMBER: 87-C70086 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1105 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	200	20
LAST 90 DAYS	10	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was on final approach to a farm strip when the right main landing gear struck a single-wire power line. The aircraft nosed down and struck the ground in a 65-degree nose-down attitude. The pilot, who was seriously injured, undid his seat- belt, and crawled from the wreckage.

The weather was suitable for the flight, and the aircraft's weight and centre of gravity were within the prescribed limits.

During the examination of the wreckage, the power line was found entwined in the right landing gear leg and wheel axle. The line stretched back over the fuselage to a broken power pole.

Prior to using the strip, the pilot had talked to the owner and was shown the rough areas on the strip, as well as the power lines in the vicinity. As he approached from the north, the pilot noted the single-wire power line that paralleled his track and crossed the west end of the strip; he planned to land well beyond the power line. The turn to final was made at 115 feet above ground level, the same altitude as the tops of the towers of a multi-strand transmission line about one-half mile west of the strip; the pilot cannot recall the final portion of the flight before the crash.

The pilot misjudged the clearance between the aircraft and the power line. When the landing gear struck the power line, the aircraft was arrested, and it pitched nose-down and struck the ground.

CONCLUSIONS:

Findings:
1. During final approach, the pilot misjudged the clearance of the aircraft above a power line.

2. The right landing gear struck the power line, causing the aircraft to pitch down and crash.

Causes:
The right landing gear struck a power line during final approach.

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PIPER PA-30 TWIN COMMANCHE C-FXYZ
HINTON/ENTRANCE AIRPORT, ALBERTA
31 OCTOBER 1987

BRIEF NUMBER: 87-W70071 (Accident)
LOCAL TIME: 1540 MST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,950	1,100
LAST 90 DAYS	27	27

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

During the landing roll-out after a local flight, the pilot was momentarily distracted by his passenger, and he inadvertently selected the landing gear up rather than the flaps up as he intended. The gear retracted, and the aircraft came to rest on its belly, damaging the nose gear, both propellers, and the underside of the fuselage.

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PIPER PA-34 SENECA C-FSIL
ANAHIM LAKE, BRITISH COLUMBIA
01 NOVEMBER 1987

BRIEF NUMBER: 87-P70094 (Accident)
LOCAL TIME: 1625 PST
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,100	220
LAST 90 DAYS	150	53

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The pilot was landing at Anahim Lake, British Columbia after a flight from Prince George. The final approach angle was shallow, and engine power was required to maintain the desired airspeed. When the pilot closed the throttle over the runway threshold, the landing gear warning horn sounded. He mistook the horn for a stall warning and landed with the gear up. The pilot had not selected the landing gear down and attributes the accident to his lack of attention.

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CESSNA 185F SKYWAGON N1227F
WHITECOURT AIRPORT, ALBERTA
03 NOVEMBER 1987

REPORT NUMBER: 87-W70907 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1715 MST
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	222	18
LAST 90 DAYS	18	18

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot was ferrying a recently purchased aircraft from Alaska to his home in Montana, U.S.A. A fuelling stop

was planned at the Whitecourt Airport, Alberta. Prior to landing on runway 28, the pilot selected 20 degrees of flap. The aircraft touched down in a three-point attitude before the brakes were applied. The pilot was unable to maintain directional control, and the aircraft veered violently off the left side of the runway and nosed over.

At the time of the accident, the runway was dry and clear, and the wind was from 270 degrees magnetic at eight knots. The aircraft was not fitted with an optional tail-wheel lock. The pilot had received a check-out when he purchased the aircraft a few days prior to the accident, but he did not have any previous tail-wheel experience.

After the accident, it was found that the left-hand wheel assembly was binding when rotated and that the left landing gear leg was loose in its mounting. Disassembly of the left brake determined that a section of the brake disc outer circumference was rubbing against the brake caliper housing, once each revolution.

Examination of the left wheel determined that it had been internally damaged through side loading. The aircraft had been ground looped on landing at the Whitehorse Airport, Yukon, the day before the accident. The ground loop resulted in damage to the left wheel outer rim and inner tube, and a local operator replaced the parts that showed obvious damage. Although taxi tests following repairs indicated that the brakes were grabbing, the pilot continued his journey the next day.

The pilot's lack of tail-wheel experience combined with the incomplete repair of the damage when the aircraft was ground looped resulted in the pilot's losing directional control of the aircraft on landing.

CONCLUSIONS:

Findings:

1. The pilot's previous tail-wheel experience was limited to a check-out carried out a few days before the accident.

2. The pilot ground looped the aircraft the previous day, damaging the left wheel.

3. The damage was incompletely repaired, thus allowing the brake disc to bind against the brake caliper.

4. The pilot undertook the flight after a taxi test indicated that the brakes were grabbing.

Causes:

The pilot undertook the flight with a known defect in the left wheelbrake.

CESSNA 210A CENTURION C-FISP
SWIFT CURRENT, SASKATCHEWAN
06 NOVEMBER 1987

REPORT NUMBER: 87-C70089 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1640 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	433	140
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

On approach to the Swift Current Airport, the pilot lowered the landing gear, but the gear actuating handle did not return to the neutral position, nor was there a safe green gear down light indication. Under normal operation, once the gear is fully down, the nose gear doors close and the gear handle returns to the neutral position. The pilot tried the emergency system but still did not get a safe indication. A flight service specialist reported that the landing gear appeared down but the nose gear doors were open. Touchdown was made on the main landing gear, but, as weight came down on the nose gear, it collapsed.

The hydraulic nose gear actuator had failed at the threaded portion of the actuating shaft; the failure was due to a low-cycle, two-way bending overload.

The landing gear system is so designed that the nosewheel landing gear actuator, the downlock latch, and the lower trunnion are used to form a drag brace on landing. The downlock latch mechanism transfers landing loads from the lower trunnion to the actuator body and trips a microswitch when the nose gear is locked down. Failure of the downlock latch would give the same cockpit indications as noted by the pilot prior to landing.

With the nose gear unlatched, landing loads are transferred through to the actuator shaft which is not designed for this type of loading.

It is probable that the downlock latch malfunctioned, causing the failure of the nose gear actuating shaft and

subsequent collapse of the nose gear. It could not be determined why the downlock latch malfunctioned.

CONCLUSIONS:

Findings:
1. The nose landing gear actuator failed in bending overload at the threaded portion of the actuating shaft.

2. The aircraft landed with the nose gear in an unlocked condition, and the nose gear collapsed.

Causes:
The Canadian Aviation Safety Board determined that the most probable cause of the accident was a malfunctioning downlock latch, which led to the failure of the actuating shaft.

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RISK OF COLLISION BETWEEN: HAWKER SIDDELY 125 C-GYYZ and CESSNA 172 SKYHAWK C-GZJK CALGARY INTERNATIONAL AIRPORT 09 NOVEMBER 1987

REPORT NUMBER: 87-W74122
LOCAL TIME: 1321 MST
INFORMATION SOURCE: Field Investigation

HAWKER SIDDELY 125 C-GYYZ

OPERATION: Private Company Business
DAMAGE: None
PILOT LICENCE: Airline Transport

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	11,500	3,000	17,350	3,050
LAST 90 DAYS	120	120	115	115

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

CESSNA 172 SKYHAWK C-GZJK

OPERATOR: Calgary Flight Training Centre
OPERATION: Speciality Flying Training
DAMAGE: None
PILOT: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,500	700
LAST 90 DAYS	250	125

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The pilot of the Hawker Siddely 125 contacted Calgary Ground Control and received an unrestricted taxi clearance to runway 16, via Alpha One taxiway. As the aircraft crossed the "hold" line for runway 25, the pilot noticed a Cessna 172 approaching from his right, apparently taking off. The pilot applied heavy braking and abruptly stopped his aircraft before it entered the runway. The pilot of the Cessna 172 continued his takeoff, unaware of any conflict.

PERTINENT INFORMATION:

At the time of the incident, the tower controller was controlling both runways 16 and 25. The Runway Occupancy Display System (RODS) indicated that both runways were under tower control. When the pilot of the Hawker Siddely called for taxi clearance, the ground controller was not able to coordinate with the tower controller the aircraft's crossing runway 25. The ground controller believed that runway 25 was not being used and that he would be able to get approval from the tower controller before the aircraft reached that intersection; however, this was not done. The tower controller did not inform the ground controller that he was departing an aircraft from runway 25; although this is not a requirement, it is the normal practice at this airport.

ANALYSIS:

The ground controller issued a taxi clearance to the Hawker Siddley to cross an active runway that was not under his control. Had the tower controller warned the ground controller that an aircraft was departing runway 25, the ground controller would have been alerted to the conflict.

CONCLUSIONS:

Findings:
1. The ground controller issued a taxi clearance to an aircraft to cross an area that was not under his control.

2. The tower controller did not warn the ground controller that an aircraft was taking-off from runway 25.

Causes:
The ground controller issued a clearance to an aircraft to cross an active runway that was not under his control.

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CESSNA 172M SKYHAWK C-FIKQ
CASTLE ROCK, BRITISH COLUMBIA
10 NOVEMBER 1987

BRIEF NUMBER: 87-P70097 (Accident)
LOCAL TIME: 1315 PST
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	468	468
LAST 90 DAYS	17	17

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

While attempting to land, the pilot encountered turbulence about 20 feet above the runway. The aircraft was thrown violently to the left, and it then entered a steep bank to the right. Before the pilot could regain control, the aircraft flew across the runway and crashed into trees bordering the runway edge.

There are open fields in the approach area and at the beginning of the runway; past that point, trees border the 100-foot-wide strip. The turbulence encounter took place as the aircraft approached the area where the trees border the strip. The wind was blowing down the runway at 10 to 17 knots. The pilot suggested that a more detailed study of the wind conditions would have better prepared him for the landing.

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AERONCA 7AC C-FJUS
SAINT-DENIS-SUR-LE-RICHELIEU, QUÉBEC
11 NOVEMBER 1987

REPORT NUMBER: 87-Q70051 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1225 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	106	30
LAST 90 DAYS	35	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was on a local pleasure flight. After about 50 minutes of flying time, he carried out a touch-and-go landing on another airstrip in the area before returning to base. During the climb-out, while the aircraft was at an altitude of 1,000 feet above ground level, the engine (Continental 065A) misfired before losing all power. The pilot actuated the carburettor heat and switched on the injection pump. The engine recovered some power but not enough to continue the flight, and the pilot force-landed the aircraft in a field. On short final, the pilot noticed an electric wire ahead and flew under it to avoid a possible collision. He did not notice the irrigation canal across his landing path, and the aircraft came to rest at the bottom of the canal. The pilot was uninjured.

The weather conditions were favourable at the time of the accident, and there was a difference of nine degrees Celsius between the ambient temperature and the dew point; this would not be conducive to carburettor icing during the period of climb power.

An inspection of the engine and its electrical system did not reveal any defects.

Before taking off, the pilot filled the tanks, giving the aircraft an endurance of 2 1/2 hours. The pilot stated that he had taken a fuel sample before leaving and found no water; however, he acknowledged that fuel contamination might have caused the engine failure. Since the aircraft was partly immersed in water, it was not possible to establish whether there was fuel contamination or an obstruction in the fuel intake.

Because of the low deceleration of the aircraft on impact, the emergency locator transmitter did not activate.

Although the reason for the power loss could not be determined with certainty, the failure was probably caused by fuel contamination.

CONCLUSIONS:

Findings:
1. The engine lost power, and the pilot force-landed the aircraft.

2. Since the aircraft was partly immersed in water on impact, it was not possible to establish whether there was fuel contamination or an obstruction in the fuel intake.

3. Because of the low deceleration of the aircraft on impact, the emergency locator transmitter did not activate.

Causes:
The Canadian Aviation Safety Board determined that the most likely cause of the power loss was fuel contamination; however, since the aircraft was partly immersed in water, it was not possible to determine the reason for the power loss.

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T.C.A. AIRCRAFT RENTALS LTD.
PIPER PA-28-140 CHEROKEE C-GHWS
VANCOUVER INTERNATIONAL AIRPORT,
BRITISH COLUMBIA
17 NOVEMBER 1987

REPORT NUMBER: 87-P70099 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0145 PST
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	330	15
LAST 90 DAYS	5	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

After a pre-flight inspection, the pilot and passenger boarded the aircraft to carry out a local visual flight rules (VFR) night flight. On the first attempt to start the engine, the pilot operated the starter for 10 to 15 seconds, but the engine did not start. On the second attempt, the engine cranked over more slowly so the pilot stopped. On the third attempt, the engine cranked over at a normal speed, then slowed and stopped, with a clicking sound coming from the starter solenoid. The pilot and passenger then smelled smoke and saw it coming from behind the front seat; the pilot turned off the master switch, and they left the aircraft to seek assistance.

The pilot returned to the aircraft with the ramp attendant. On opening the cockpit door, he saw that the cabin was full of smoke, and he could see a red glow in front of the rear seat. He ran to phone the airport fire department, leaving the aircraft door open. Shortly after the fire trucks arrived, there was an explosion, and the right wing bulged outward. The fire was quickly brought under control, but the cabin area was completely gutted.

The company had purchased this used aircraft five months previously and had experienced starting problems with it ever since. Three batteries had been damaged due to broken and melted terminal posts. After the negative post had melted on the second battery, the aluminum ground wire was replaced with a copper wire, but the aluminum positive lead was not replaced. It had also been necessary to jump-start the aircraft numerous times by connecting jumper leads from a car battery to the aircraft battery, located under the right rear passenger seat just behind the front wing spar. The battery was enclosed in a plastic box which, when tested after the fire, was found to ignite readily and sustain combustion. The fuel line from the right fuel tank ran three inches in front of the battery box and was found to be split where heat had caused it to fail.

Two parachute flares, part of a survival kit stored in the pocket on the back of the front passenger seat, had ignited from the heat. One was found embedded in the back of the rear seat and the other under the instrument panel.

The small fire extinguisher found on board did not meet the requirements of the approved fire extinguisher that should have been carried, as defined in the Engineering and Inspection Manual. No attempt was made to use this small fire extinguisher.

Piper Service Bulletin 836A, dated August 1986, calls for replacement of the aluminum battery leads on this aircraft. Piper considered compliance mandatory and stated that "corrosion in the aluminum wire and terminal causes high resistance, and, if left uncorrected, excessive heat build up could result in an electrical fire." Service Bulletins are not mandatory.

Tests carried out on the aluminum positive lead and terminal after the accident revealed that, when a heavy current draw was applied, the terminal became hot to the touch within five seconds and, within 12 seconds on a second attempt, was hot enough to cause paper wrapped

around the terminal to smoke. It was concluded that this heat was caused by high resistance due to corrosion in the wire inside the terminal.

When the pilot attempted to start the aircraft, the positive terminal of the battery heated sufficiently to ignite the plastic battery box. The fire then slowly progressed until it ignited the two flares, which rapidly intensified the fire. The fire burned through the right fuel tank line and caused the explosion in the right wing before the fire department was able to bring the fire under control. The fire could have probably been extinguished with the small extinguisher had an attempt been made by the pilot or the ramp attendant while the fire was still at the smoldering stage.

CONCLUSIONS:

Findings:

1. Corrosion developed in the aluminum terminal of the positive battery wire and caused high resistance.

2. Under high current loads, the positive terminal of the battery became hot enough to ignite the plastic battery box.

3. The plastic battery box was made of combustible material.

4. The right fuel tank line located adjacent to the battery box burned through and led to an explosion in the right wing.

5. Two flares in the aircraft ignited and intensified the fire.

6. The aircraft was not equipped with an approved fire extinguisher.

7. The owner had not fully complied with Piper Service Bulletin 836A.

8. Service Bulletins are not mandatory.

9. No attempt was made to locate and extinguish the fire in its early stages.

Causes:

Corrosion in the aluminum battery terminal caused it to overheat under a high current load and ignite the plastic battery box. The fire was intensified when two flares ignited and a nearby fuel line split, causing an explosion.

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CESSNA C172RG CUTLASS C-GPIV
TURTLE LAKE, ONTARIO
20 NOVEMBER 1987

REPORT NUMBER: 87-C70091 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1021 EST
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	95	8
LAST 90 DAYS	31	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	1	-

SUMMARY REPORT:

The pilot and passenger were conducting a visual flight rules (VFR) flight from Atikokan, Ontario to Winnipeg, Manitoba. Shortly after take-off, the aircraft flew through some misty cloud, and the pilot descended to maintain visual contact with the ground. After the aircraft had levelled off, the engine began to run rough and lose power. The pilot applied carburettor heat, but the engine continued to run rough. The pilot selected a marshy clearing and made a forced landing. On touchdown, the aircraft bounced, dug in, then nosed over. The occupants suffered serious injuries but were able to escape from the wreckage and were rescued several hours later.

The engine, engine components, fuel system, and ignition system were examined after the accident, and no faults were found.

Prior to departure for this flight, the engine ran rough on two occasions; in both instances, the pilot applied carburettor heat, and the engine ran normally again. In this case, th ; carburettor heat control was off, and the engine ran normally during the take-off and climb-out. While cruising at 4,000 feet above sea level, the carburettor air temperature gauge indicated that the carburettor temperature was in the range conducive to carburettor icing. Carburettor heat was momentarily applied by the pilot, then turned off. After the descent, the rough running engine ran at a maximum of about 1200 rpm. Carburettor heat was applied but without result, and the engine continued to run rough until the aircraft landed.

The aircraft was landed with both the flaps and the landing gear up. Just before touchdown, the pilot nosed the aircraft down to ensure that the landing was in a swamp and to prevent a possible overrun into some trees; as a

result, the aircraft was landed at a speed in excess of 90 knots. The Cessna 172RG operator's manual recommends the use of 30 degrees of flaps and a landing speed of 65 knots for a forced landing.

The aircraft came to a complete stop in a distance of less than 80 feet after ground contact. The pilot and passenger were each wearing a lap belt and shoulder harness, which prevented more serious injuries.

The pilot's knowledge of procedures to counter carburettor icing was inadequate. Carburettor icing had been encountered on the ground twice before take-off and had been corrected. During the flight, when the carburettor air temperature gauge indicated that heat should be applied, the pilot applied carburettor heat for a few seconds only; as the engine was running well, he did not want to use carburettor heat and lose some engine power. As a result, the engine lost power because of carburettor icing.

CONCLUSIONS:

Findings:

1. The pilot did not employ the correct procedure to prevent carburettor icing.

2. The engine lost power because of carburettor icing, resulting in a forced landing.

3. The forced landing was carried out without the use of flaps.

4. The use of lap belts and shoulder harnesses minimized injuries to the pilot and passenger.

Causes:

The pilot did not employ the correct procedure to prevent carburettor icing; as a result, the engine lost power and the aircraft was force-landed.

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PAGE FLIGHT
BEECH AIRCRAFT CORPORATION
BE 200 SUPER KING AIR N6757M
LONDON AIRPORT, ONTARIO
20 NOVEMBER 1987

REPORT NUMBER: 87-O/70905
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1910 EST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport (U.S.A.)

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	7,500	3,000	2,900	1,500
LAST 90 DAYS	150	150	130	130

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	1

HISTORY OF THE FLIGHT:

The aircraft, with two pilots and one passenger on board, was on an instrument flight rules (IFR) flight from Toronto to London, Ontario. The aircraft landed on runway 15 which was covered with snow. The initial touchdown was normal; however, shortly after the nosewheel touched down, the aircraft started to veer to the right. The co-pilot, who was in the left seat and at the controls, corrected with the application of left rudder. A loud bang was then heard, and the aircraft dropped onto its nose and skidded to a stop in the centre of the runway.

PERTINENT INFORMATION:

At the time of the accident, conditions at the London Airport were precipitation ceiling 500 feet overcast, visibility one-half mile in moderate snow, temperature minus six degrees Celsius, dew point minus seven degrees Celsius, and wind from 290 degrees magnetic at six knots. Snow-clearing operations were in effect at the time, and the centre 80 feet of the 200-foot-wide runway had been ploughed but had become re-covered with snow to a depth of one half to three quarters of an inch while the ploughing equipment waited for inbound traffic. The unploughed runways were covered with three inches of snow. The James Brake Index (JBI) on runway 15 ranged from 0.30 one hour before the accident to 0.25 three hours after the accident.

The nose landing gear strut was found to have failed at both hinge points and at the drag brace attachments. The right-handhinge point fractured through the nose strut casting in an overload mode with the bolt, nut, and bushing still attached to the aircraft fuselage and undistorted. The left-hand hinge point was undamaged; however, the nut had been stripped from the pivot bolt which was bent and broken. The bolt fracture was also overload. The drag link had fractured in overload at the strut attachment. A four-square-inch area of the right sidewall of the nosewheel tire was badly scuffed. Also on the right sidewall were radial scratches around the circumference of the tire.

ANALYSIS:

The aircraft was landing on a slippery, snow-covered runway with a 40-degree tail wind from the right. The cross-wind and slippery runway conditions were likely instrumental in causing the aircraft to veer to the right. When the co-pilot corrected with a normal left rudder input, the nosewheel steering linkage would have turned the nosewheel to the left. The radial scratch marks on the right sidewall of the tire indicate that the nose tire was skidding sideways while it was still rotating; this was possible because of the slippery runway conditions. The side load on the skidding nose tire would be felt in an aft direction, and the load was sufficient to fail the nose strut casting at the right pivot point. The nose gear then started to collapse and rotate more to the right, placing a side load on the nut of the left pivot bolt which was then sheared off the bolt. As the nose gear continued to collapse, the drag link attachment was broken off the nose strut. The aircraft then fell onto the collapsed strut and dragged the tire, which was no longer rotating, along the runway.

CONCLUSIONS:

Findings:

1. The runway was snow-covered and slippery.

2. There was a 40-degree tail wind from the right at six knots.

3. The aircraft began to veer to the right.

4. Left rudder input resulted in the nosewheel skidding sideways.

5. The nose landing gear failed in overload.

Causes:

The nose landing gear collapsed while it was skidding sideways on the runway.

CESSNA U206A SUPER SKYWAGON C-FUEZ
BOYLE, ALBERTA 7 mi W
22 NOVEMBER 1987

REPORT NUMBER: 87-W70076
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1900 MST
OPERATION: Private Company Business
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,600	320
LAST 90 DAYS	35	35

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The pilot departed from Chipewyan Lakes, Alberta on a night visual flight to Athabasca, Alberta. When the aircraft failed to arrive at its destination, a search was commenced. The wreckage of the aircraft was located the following day approximately seven nautical miles west of Boyle, Alberta (13 nautical miles southeast of the Athabasca Airport). The aircraft had struck a stand of poplar trees located on a knoll that was higher than the surrounding farm land and was destroyed. The pilot received fatal injuries.

PERTINENT INFORMATION:

Examination of the wreckage did not determine any pre-impact mechanical discrepancies. The pilot's private licence was authorized for day or night visual flight rules (VFR) flight. An autopsy and toxicological examination did not reveal any indication of pre-impact incapacitation of the pilot.

Prior to the flight, the pilot had telephoned his home in Athabasca several times and had been advised of low cloud and fog in the area. On the day of the accident, a charter operator from Athabasca had advised the pilot of the low ceilings in the area of the intended flight. The weather conditions in the accident area were reported as ceiling and visibility near zero in low cloud or fog and freezing drizzle. The route flown was over a sparsely populated area with few, if any, ground lights. It was reported that the non-directional beacon (NDB) at the Athabasca Airport had been operating at reduced transmission output. This beacon was operated by the Gov-

ernment of the Province of Alberta as a Class A nav aid. It was listed in the Canada Flight Supplement as a private, unmonitored NDB, which may experience unscheduled outages without Notice to Airmen (NOTAM).

The aircraft's emergency locator transmitter (ELT) had been torn from its mounting during the impact sequence. The antenna cable remained attached to the ELT but had separated at the antenna to cable fitting; however, Search and Rescue aircraft were able to pick up the ELT signal and locate the aircraft despite the damaged antenna.

ANALYSIS:

The pilot was aware of the poor weather conditions that prevailed at Athabasca when he departed from the Chipewyan Lake strip. When he encountered low cloud and fog en route, he elected to continue rather than divert to an alternate airport. The freezing drizzle reported may have resulted in airframe icing, a loss of visibility due to windscreen icing, and a loss of reception of navigation beacons (NDB and VOR) due to antenna icing.

The pilot may have attempted to use the Athabasca NDB as a navigation aid, but its reduced transmitter output would have restricted its effective range. As the flight progressed southward, darkness, low ceilings, and visibility would have made visual flight impossible. The wings-level attitude of the aircraft when it hit the trees indicates that the pilot had not lost control prior to impact. It is probable that the pilot was attempting to maintain visual contact with the ground and flew the aircraft into the trees.

CONCLUSIONS:

Findings:

1. The pilot attempted to continue a visual flight into adverse weather conditions.

2. It is probable that the pilot was attempting to maintain visual contact with the ground and flew the aircraft into the trees.

3. The Athabasca NDB was operating at a reduced transmitter output, resulting in a restriction in its effective range.

4. The ELT was effective in aiding the Search and Rescue aircraft to locate the wreckage.

Causes:

The pilot attempted to continue a visual flight into adverse weather conditions.

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SOUTH COAST AVIATION
PIPER PA-28-181 CHEROKEE ARCHER N3815M
GOOSE BAY, NEWFOUNDLAND 69 mi SW
22 NOVEMBER 1987

REPORT NUMBER: 87-A70905 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1748 AST
OPERATION: International Contract
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	11,000	200
LAST 90 DAYS	100	100

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft was on an instrument flight rules (IFR) flight from Bangor, Maine to Goose Bay, Newfoundland. The pilot was flying in darkness and between cloud layers at 9,000 feet above sea level (asl). Approximately 100 nautical miles southwest of Goose Bay, the aircraft entered cloud and, shortly thereafter, began to lose airspeed and altitude. With the aid of a flashlight, the pilot determined that ice was accumulating rapidly on the aircraft. The aircraft was not equipped with an airframe de-icing system. The engine began to lose power, and, although the pilot selected the carburettor heat on, engine power could not be restored. About 30 minutes after encountering the icing conditions, the aircraft crashed because airspeed and altitude could not be maintained. The pilot was seriously injured.

At the time of the accident, the Labrador and Eastern Québec areas were under the effect of a low pressure area centred just north of the crash site, with an associated cold front extending eastward and a trough extending southward. Ahead of the cold front, surface temperatures were above freezing, and there were occasional rain showers. Behind the cold front, temperatures were below freezing, with snow and blowing snow.

Before departing Bangor, the pilot obtained a weather briefing by telephone from the Bangor Flight Service Station (FSS). The briefing included some general weather information along the route, the area forecast for Maine, the Goose Bay actual and forecast weather, the Sept Isles forecast, and the winds and temperatures over Maine, Mont Joli, Sept Isles, and Goose Bay.

Maine – Area Forecast (abbreviated) – Ceilings as low as 1,000 feet with cloud tops to 15,000 feet, visibility generally three to five miles in light snow and blowing snow, surface winds northwesterly with gusts to 35 knots.

Goose Bay – Actual 1400 Coordinated Universal Time (UTC) – Estimated 2,500 feet broken, visibility 12 miles, temperature nine degrees Celsius, dew point six degrees Celsius, wind 130 degrees at 23 gusting to 30 knots.

Goose Bay – Forecast 1700-2100 UTC – Ceiling 1,500 feet broken, light rain showers, winds from the east at 12 knots. Occasional ceiling 500 feet overcast, visibility three miles in light rain showers and fog.

Sept Isles – Forecast – Ceiling 1,500 feet broken, visibility five miles in light snow, winds from the west at 20 gusting to 30 knots. Occasional ceilings 900 feet, sky obscured, visibility one mile in light snow or blowing snow, winds from the west at 25 gusting to 30 knots.

Winds and Temperatures

	9,000 feet		6,000 feet	
Maine	320°/36 knots	–13°C	330°/39 knots	
Mont Joli	350°/28 knots	–10°C	350°/38 knots	
Sept Isles	080°/10 knots	–9°C	030°/16 knots	
Goose Bay	170°/54 knots	–8°C	170°/46 knots	–2°C

During the briefing, the pilot did not ask for, nor was he offered, the area forecasts for the Canadian portion of his flight. (An area forecast predicts all the weather elements affecting flight over a particular area, including information on anticipated icing conditions.) The area forecast valid for Labrador and Eastern Québec contained a prediction of light to moderate rime icing in cloud within 175 miles of the low pressure area, moderate clear icing at the rain snow/boundary, and moderate to heavy clear icing in towering cumulus cloud near the cold front. The planned route was south of the low pressure area and passed through both the trough and the cold front.

The Aeronautical Information Publication (AIP) Canada, published by Transport Canada, contains the following information regarding flight in icing conditions: "The effects of ice accretion on aircraft are cumulative – thrust is reduced, drag increases, lift lessens, weight increases. The results are an increase in stall speed and a deterioration of aircraft performance. In extreme cases, two to three inches of ice can form on the leading edge of the airfoil in less than five minutes. It takes but half an inch of ice to reduce the lifting power of some aircraft by 50 percent and increases the frictional drag by an equal percentage."

Because the pilot did not obtain the appropriate area forecast, he did not know that he would be flying into an area of hazardous icing conditions. However, the forecasts of snow and rain should have prompted the pilot to consider the possibility of encountering icing conditions and ask the appropriate questions of the briefer. After encountering the icing, the pilot believed that, under the circumstances, it was more prudent to continue to Goose Bay, which was the closest suitable airport, than to turn around. Ice buildup on the engine air intake filter, the propeller, and the airframe caused a reduction in the performance of the aircraft to the point where airspeed and altitude could not be maintained.

CONCLUSIONS:

Findings:

1. The pilot did not request or receive the appropriate Canadian area forecasts.

2. The pilot was not aware that icing conditions were forecast along his planned route.

3. Ice accretion on the aircraft degraded its performance to the point where airspeed and altitude could not be maintained.

Causes:

The pilot attempted flight in icing conditions for which the aircraft was not equipped.

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CESSNA 180 SKYWAGON C-GRMK
CLARESHOLM, ALBERTA
22 NOVEMBER 1987

BRIEF NUMBER: 87-W70075 (Accident)
LOCAL TIME: 1515 MST
OPERATION: Private Other
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	374	220
LAST 90 DAYS	8	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The aircraft had returned to the Claresholm Airport for landing following a one-hour search-training exercise.

The wind was variable from 190 to 270 degrees and gusting between 20 and 35 knots. The first approach was unsatisfactory because of the wind conditions, and the pilot elected to go around. The aircraft landed normally on the second approach, but the pilot was unable to maintain directional control during the roll-out. The aircraft veered left off the runway and nosed down.

BEECH A-24R SUNDOWNER C-GJQR
DRAYTON VALLEY, ALBERTA
27 NOVEMBER 1987

REPORT NUMBER: 87-W74144 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1620 MST
OPERATION: Private Recreational
DAMAGE: Minor
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	125	75
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot, accompanied by a passenger, was conducting a local recreational flight. While approaching the Drayton Valley Airport for a landing, the pilot selected half flap and extended the landing gear. On touchdown, at a speed of 85 mph, the pilot selected flaps up and applied the brakes. The aircraft's nose dropped, and the propeller struck the runway. The aircraft veered to the left, and the left main gear retracted just before leaving the paved runway edge. The aircraft came to rest on the left wing tip and nose.

When the aircraft was picked up, the left main gear and nose gear dropped to the down-and-locked position. Examination of the landing gear system and components failed to indicate any mechanical discrepancies.

The pilot reported he did not believe that he had inadvertently selected the gear up on landing. The cause of this occurrence could not be determined.

CONCLUSIONS:

Findings:
1. The nose gear and left main gear retracted on touchdown.

2. The aircraft swerved off the runway.

Causes:
It could not be determined why the landing gear retracted on touchdown.

CESSNA 180H C-FWXT
ANAHIM, BRITISH COLUMBIA
29 NOVEMBER 1987

BRIEF NUMBER: 87-P70100 (Accident)
LOCAL TIME: 1340 PST
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,500	700
LAST 90 DAYS	150	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

Following the conversion from floats to wheels, the aircraft was flown from Victoria to Anahim, British Columbia. During the landing roll, in a slight cross-wind from the left, the aircraft started to veer toward the left, and the pilot applied the brakes for directional control. The aircraft then swung to the right and ground looped; the left main gear collapsed.

The hydraulic line to the left brake had corroded where it passed through a rubber hose which protected it from chafing against the gear leg bracket. Hydraulic fluid escaped through pin holes in the corroded area, and the left brake failed.

COLLISION BETWEEN:
CESSNA 210B CENTURION C-GJRZ and
CESSNA C190 C-FNPT
LANGLEY AIRPORT, BRITISH COLUMBIA
05 DECEMBER 1987

REPORT NUMBER: 87-P70801 (Accident)
LOCAL TIME: 1108 PST
INFORMATION SOURCE: Field Investigation

CESSNA 210B CENTURION C-GJRZ

OPERATOR: Peace Arch Flying Club
OPERATION: Private Recreational
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	650	200
LAST 90 DAYS	4	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

CESSNA 190 C-FNPT

OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	850	400
LAST 90 DAYS	2	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The Cessna C210 aircraft was parked on the grass facing the edge of taxiway Bravo near the fuel pumps. The aircraft propeller was over the pavement to avoid stone damage once the engine was started. The pilot started the engine and was listening to the Automatic Terminal Information Service (ATIS) when he observed a Cessna C190 taxi past the fuel pumps, enter the 30-foot-wide taxiway, and come toward his aircraft. He expected that the C190 would move over to the far side of the taxiway as the nose of the C210 was over the taxiway, but the C190 came down the middle of the taxiway. The right wing of the C190 struck the C210's rotating propeller, and a five-foot section of the wing was cut off.

The C190 is a tail-wheel-equipped aircraft with a nose-up attitude when on the ground, hence, the pilot's visibility forward and to the right is obscured while taxiing. In order to see ahead and to the right, a pilot must taxi in a zigzag manner.

The pilot of the C190 stated that he looked along the taxiway as he made the turn at the fuel pumps but did not see the parked C210 which was about 230 feet from the pumps. The C190 pilot did not taxi in a zigzag manner and did not see the C210 as he taxied toward it.

Although the taxiway was narrow and did not permit large zigzags to be made, it is incumbent on a pilot to ensure he is clearing all obstacles; the pilot of the C190 did not do this.

CONCLUSIONS:

Findings:
1. The pilot of the C190 had restricted forward visibility while taxiing and did not see the C210.

2. The taxiway was narrow.

3. The pilot of the C190 did not ensure his taxi path was clear.

Causes:
The pilot of the C190 did not ensure his taxi path was clear.

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CESSNA 172 SKYHAWK N5889R
WATSON LAKE, YUKON 14 mi W
05 DECEMBER 1987

REPORT NUMBER: 87-W70908 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 0930 PST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,040	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

While flying from Watson Lake to Whitehorse, Yukon, the pilot encountered fog and decided to make a precautionary landing on a straight section of the Alaska High-

way. After touchdown, the pilot saw a white road sign on the left side of the highway. When the pilot attempted to miss the sign, the right main gear struck a snow ridge left by a road grader, and the aircraft came to rest in a ditch to the right of the highway. The aircraft was substantially damaged.

Before departing from Watson Lake, the pilot received a weather briefing which forecast the possibility of low cloud and fog. When the pilot began to descend to maintain ground contact, he realized that the fog was rapidly reducing the visibility and decided to make a precautionary landing.

The pilot flew over the selected landing site to check for obstacles before landing, but, because of the deteriorating weather, he was unable to check the landing area properly and did not see the road sign. While attempting to avoid the sign during the roll-out, the pilot lost control of the aircraft when the right wheel struck the snow ridge.

CONCLUSIONS:

Findings:
1. The pilot continued flight into deteriorating weather conditions.

2. The portion of highway selected for a precautionary landing had a road sign near the left edge.

3. The pilot did not see the road sign before landing.

4. During the attempt to miss the sign, the pilot lost control of the aircraft.

Causes:
The pilot lost control of the aircraft when he hit a snow ridge during a precautionary landing on the road.

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ZENITH CH 250 (Amateur-built) C-GETZ
OSHAWA AIRPORT, ONTARIO 1 1/4 mi SE
06 DECEMBER 1987

REPORT NUMBER: 87-O/70088 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1623 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	935	148
LAST 90 DAYS	31	31

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and passenger were returning to home base upon completion of a short cross-country flight. After the aircraft had turned on final approach for landing, the controller observed a trail of black smoke behind the aircraft and then received the pilot's MAYDAY call. The engine (Lycoming O-290-D) lost power, and the pilot force-landed the aircraft on a city street.

A fuel pressure test after the accident showed that, as fuel was introduced to the carburettor, it flowed past the needle valve and through the nozzle, pouring out of the carburettor throat, thus indicating an improper seating of the needle valve. Disassembly of the carburettor revealed many worn components, including the face and sides of the needle valve.

The needle valve, which was improperly seated, allowed an overly rich fuel/air mixture to flood the engine, causing it to stop.

CONCLUSIONS:

Findings:
1. The carburettor was in a generally worn-out condition.

2. The carburettor needle valve stuck open because it was worn.

3. The fuel/air mixture became excessively rich when the needle valve stuck open.

4. The engine failed when it was flooded by the excessively rich mixture.

Causes:
The aircraft's engine lost power because of inadequate carburettor maintenance.

CESSNA 170B C-GSCE
HANNA, ALBERTA
10 DECEMBER 1987

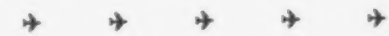
BRIEF NUMBER: 87-W70084 (Accident)
LOCAL TIME: 1415 MST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	700	500
LAST 90 DAYS	60	60

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was conducting a full-flap, wheel landing on runway 29. Just before the tail wheel was on the runway, the aircraft veered to the left. Despite application of the brake, the pilot was unable to maintain directional control, and the aircraft ground looped. The right-hand axle bolts failed, and the right wing contacted the ground heavily, resulting in substantial damage. The wind was 50 degrees off the runway at 10 to 15 mph.



AERONCA CHIEF IIAC C-FEXJ
BELOEIL, QUÉBEC
12 DECEMBER 1987

BRIEF NUMBER: 87-Q70057 (Accident)
LOCAL TIME: 1450 EST
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:

	INSTRUCTOR		PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	6,000	300	125	-
LAST 90 DAYS	180	5	-	-

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The owner/pilot of the tail-wheel-equipped aircraft, who had no previous experience on type, was being checked out on his aircraft by a qualified instructor. The aircraft was dual-control-equipped, but brakes were not available from the right seat. The pilot, who was at the controls and sitting in the left seat, landed the aircraft; the wind was blowing from the right at approximately 10 knots. During the landing roll, the aircraft veered to the right, and the instructor immediately took control. He applied full power and full left rudder; however, the rudder pedal broke, and the engine lost complete power since the carburettor was not equipped with an accelerating pump. Directional control could not be regained, and the aircraft departed the runway coming to rest in a ditch running parallel to the runway.

CESSNA 337 SKYMASTER N2QU
GOOSE BAY, LABRADOR
27 DECEMBER 1987

BRIEF NUMBER: 87-A70907 (Accident)
LOCAL TIME: 1832 AST
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	12,800	40
LAST 90 DAYS	80	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot landed on runway 26 after completing a visual approach. The wind was 250 degrees at less than 10 knots. The landing gear and flaps were down, and the aircraft speed was normal for the configuration. The touchdown was normal, but, while the aircraft was slowing down, the nose gear collapsed. The aircraft slid to a stop on the runway.

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CESSNA A185F SKYWAGON C-GKMU
CALGARY INTERNATIONAL AIRPORT, ALBERTA
28 DECEMBER 1987

REPORT NUMBER: 87-W70086 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1130 MST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	947	53
LAST 90 DAYS	5	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot attempted to start the aircraft engine, but it became flooded with fuel, and the battery ran down. After checking that the magneto switch was in the OFF position, he turned the propeller by hand in the normal direction of rotation to clear the engine. The engine then started at high rpm, and, as the aircraft was not prevented from moving ahead and no one was at the controls, the aircraft accelerated. It narrowly missed one aircraft, demolished the left wing of another, and came to a stop against a power pole and security fence.

Examination of the magneto switch and the primary leads to both right and left magnetos revealed that both magnetos were live when the switch was in the OFF position. Further examination revealed that the plastic cover, which was also a contact plate on the back of the magneto switch, had a screw missing. The cover had separated sufficiently to open the switch contacts which then left the magnetos without an electrical ground. Normally, the magnetos would have been grounded when the switch was in the OFF position.

When the pilot rotated the propeller in the direction of engine rotation, the magneto impulse engaged and retarded the magneto spark to start the engine. Propeller rotation opposite the direction of engine rotation would have prevented the engagement of the magneto impulse, and the engine would not have started.

CONCLUSIONS:

Findings:
1. When the pilot attempted to start the engine, it flooded and the battery ran down.

2. The pilot rotated the propeller manually in the direction of engine rotation to clear the engine.

3. A defective magneto switch caused the magnetos to be live, with the switch in the OFF position.

4. The magneto impulse engaged and the engine started.

Causes:
The magnetos were live with the magneto switch in the OFF position.

SAFETY ACTION:

Action Taken:
As a result of this occurrence, the Canadian Aviation Safety Board issued three recommendations (CASB 88-12 to 88-14). These recommended that Transport Canada encourage aircraft manufacturers to include in their aircraft flight manuals the procedure for the conduct of live magneto checks. In addition, Transport Canada should emphasize the need for and correct method of conducting live magneto checks through its ongoing programs of safety promotion and through its civil flight instructor refresher courses.

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CESSNA 150 CF-SZA
MINISTIKWAN LAKE, SASKATCHEWAN
08 JANUARY 1988

REPORT NUMBER: 88-C0009 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0930 CST
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: None

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	N/A	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	1	-	-

HISTORY OF THE FLIGHT:

The pilot and his wife departed from the ice strip at Ministikwan Lake for a visual flight rules (VFR) flight to Unity, Saskatchewan. When the pilot failed to arrive at his destination, his friends, who were waiting for his arrival, contacted the RCMP, who initiated the search and rescue process. The following morning, the burned-out wreckage of the aircraft was located in a densely wooded area, three-quarters of a mile from the ice strip. Both occupants were fatally injured.

PERTINENT INFORMATION:

The evidence indicated that the aircraft had descended in a vertical nose-down attitude and had struck the ground at a relatively low speed. The control systems were examined, and no evidence of any malfunction was found. The aircraft propeller had severed an eight-inch-diameter tree horizontally as the aircraft descended through the trees, indicating that the engine was developing power on impact. The aircraft had been fuelled with automative fuel, although this was not considered to be a factor in the accident.

The aircraft's centre of gravity was estimated to have been within limits, but the weight of the aircraft was estimated to have been slightly over the maximum allowable at take-off.

The weather forecast for the area called for ragged ceilings between 400 and 800 feet above ground level (agl), with generally good visibilities in light snow. Rime icing was predicted, and the outlook was for instrument flight rules (IFR) conditions.

From actual weather observations taken by stations located approximately 60 miles from the accident site, the ceilings in the Ministikwan Lake area would have ranged from 300 to 500 feet agl. Other pilots in the area reported that they had not flown that morning because of poor weather conditions. It could not be determined if the pilot had obtained weather information before departing.

A coating of hoar frost had covered the area the night before the accident. Footprints leading to the aircraft indicated that the wing tank fuel drains had been checked but that an external inspection had not been carried out. Thus, the aircraft was probably covered with frost, which would have affected its performance.

The pilot did not have a pilot's licence. A few days prior to the accident, he had passed a medical examination for a student pilot permit. Two and a half months prior to the accident, the pilot had received 15 hours of dual instruction of which two were on the occurrence aircraft. The pilot had recently purchased the aircraft, and it was known that the pilot had flown since that time, but the total amount of time could not be determined.

The emergency locator transmitter (ELT) was consumed by fire, and it could not be determined if it had activated.

ANALYSIS:

The low-speed vertical descent prior to impact and the propeller cuts on the tree indicate that the aircraft had stalled with power on. The pilot probably encountered the low cloud ceilings shortly after take-off. The combination of the pilot's lack of flying experience, the low ceilings, the degraded aircraft performance due to frost-covered flying surfaces, and the heavy weight of the aircraft resulted in the stall and subsequent loss of control.

CONCLUSIONS:

Findings:

1. The pilot had very little flying experience and did not hold a pilot's licence.

2. No attempt was made to remove hoar frost from the aircraft prior to take-off.

3. The pilot took off for a VFR flight in very poor weather conditions and may have inadvertently entered cloud.

4. The aircraft stalled at low altitude.

5. There was no evidence of an aircraft or engine system malfunction.

Causes:
The precise cause of the accident could not be determined; however, a lack of flying experience, low cloud ceilings, frost on the flying surfaces, and an aircraft weight exceeding the limits may have combined to result in a stall and loss of control at low altitude.

PIPER PA-24-250 COMANCHE C-FLHT
OTTAWA INTERNATIONAL AIRPORT, ONTARIO
10 JANUARY 1988

REPORT NUMBER: 88-O/0008 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0030 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	150	13
LAST 90 DAYS	13	13

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was in the process of externally securing the aircraft at the general aviation ramp area at Ottawa International Airport, Ontario, and, when he moved the propeller, he inadvertently started the engine. The pilot received a serious leg injury, and the aircraft was substantially damaged when it rolled forward and struck another aircraft.

The outside air temperature was minus 11 degrees Celsius, and the sky conditions were clear.

The pilot and passenger had arrived at Ottawa the previous afternoon. After midnight, the pilot and passenger were attempting to fly back to Montreal; however, the aircraft battery state was low, and the starter would not rotate the engine fast enough to start it. After several unsuccessful attempts to start the engine by turning the propeller by hand, they decided to abandon the attempt to return to Montreal until the following morning. The passenger then remained in a warm shelter near the ramp area, while the pilot returned to the aircraft for one final normal starting attempt prior to securing the aircraft for the remainder of the night. The aircraft did not start, and the pilot left the cockpit to secure the aircraft. The pilot chocked the tires and was moving the propeller to a horizontal position when the engine started. The pilot's right leg, above the ankle, was struck by the propeller which caused serious injury. The unoccupied aircraft then taxied across the ramp and collided with a parked aircraft, causing substantial damage to both aircraft. When the pilot left the aircraft, he had neglected to put the engine controls and ignition switch in their safe positions.

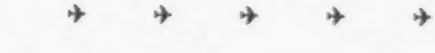
When the pilot moved the propeller, the engine throttle was partially open and adequate fuel/air mixture was in the combustion chambers from previous starting attempts. The movement of the propeller released the impulse coupling in the magnetos which produced sufficient ignition spark to start the engine. Had the pilot turned the ignition switch to the OFF position, thus grounding the magnetos, the engine would not have started.

CONCLUSIONS:

Findings:
1. The pilot left the cockpit with the ignition switch in the ON position.

2. The engine started when the pilot moved the propeller by hand.

Causes:
The pilot exited the aircraft without properly securing the cockpit.



BEECHCRAFT BONANZA A-36 C-GXQA
CHELMSFORD, ONTARIO
13 JANUARY 1988

BRIEF NUMBER: 88-O/0017 (Accident)
LOCAL TIME: 1430 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	202	120
LAST 90 DAYS	35	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The aircraft was on final approach to land at a private 3,200-foot runway when the pilot noticed snow-removal equipment by the threshold of the runway. He landed the aircraft beyond the equipment, but he could not stop the aircraft before it struck a snowbank at the end of the runway.

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STINSON 108-1 C-GQRE
BROOKS, ALBERTA 5 mi S
16 JANUARY 1988

BRIEF NUMBER: 88-W0007 (Accident)
LOCAL TIME: 1530 MST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	106	10
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was attempting to take off from a private strip when, just prior to becoming airborne, he lost directional control of the aircraft. It veered off the runway to the left where the right main landing gear collapsed, allowing the right wing to strike the ground. The pilot was relatively inexperienced flying tail wheel aircraft.

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PIPER PA-11 CUB SPECIAL C-GYPC
THUNDER BAY, ONTARIO 7 mi NW
17 JANUARY 1988

REPORT NUMBER: 88-C0016 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1330 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	327	150
LAST 90 DAYS	3	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was returning to his private landing strip after conducting touch-and-go landings at a nearby airport. The aircraft was at approximately 700 feet above ground level when the engine lost power. The pilot applied carburettor heat in an attempt to restart the engine, but this was not immediately effective. The pilot then carried out a forced landing in a clearing bordered by trees; after touchdown, the left wing struck a tree, and the aircraft swung into the trees. Following the forced landing, the engine regained power.

The weather was excellent, but, with a temperature of zero degrees Celsius and a dew point of minus six degrees Celsius, the atmospheric conditions were conducive to carburettor icing. The engine lost power because of carburettor icing, and there was insufficient altitude remaining to allow time for the application of carburettor heat to correct the situation.

CONCLUSIONS:

Findings:
1. The engine lost power as a result of carburettor icing.

2. Insufficient altitude remained to allow time for the engine to regain power when carburettor heat was applied.

Causes:
The engine lost power because of carburettor icing.

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CESSNA 150G C-FVYE
MARKHAM AIRPORT, ONTARIO
26 JANUARY 1988

REPORT NUMBER: 88-O/0032 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1715 EST
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:

	INSTRUCTOR		STUDENT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	600	250	95	95
LAST 90 DAYS	250	160	40	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and his instructor departed the airport on a local instrument training flight. Shortly after take-off, at an estimated altitude of 250 feet, there was a sudden loud bang from the engine (Continental 0200A) which began to run rough and lose power, and then stopped completely. The instructor took control of the aircraft and prepared for a forced landing. Because of obstructions straight ahead, the instructor manoeuvred the aircraft to the left in an attempt to land on a road which ran parallel to, and about 280 feet to the left of, the runway centre line. An automobile turned onto the road, and the instructor, unable to land without striking the automobile, turned left to land on a grassed area beside the road. Touchdown occurred while the aircraft was at a bank angle of about 25 degrees in a slight nose-up attitude, and the right wing tip struck the ground. The aircraft became level as it rolled along the grass surface. The left horizontal tail plane then struck a large hawthorne bush, causing the rear fuselage structure to separate at the leading edge of the tail plane. The aircraft came to rest in a nose-down, left-wing-low attitude.

Examination of the engine revealed that the number three cylinder head had failed and separated above the fifth fin from the base of the head. The cylinder failed because of a high-cycle fatigue crack which had originated in the threaded portion of the cylinder head. It is considered that the fatigue had originated and progressed under normal service loads. No material or manufacturing deficiencies were found. Engine log book entries indicated that the engine had been overhauled twice and had run 638 hours since the last overhaul. The previous overhaul had been carried out at the Teledyne Continental factory in July 1974. The total time on the engine was unknown; however, the time since the first log book entry at the first overhaul was 1,637 hours. A compression test had been carried out on the failed cylinder 33 hours prior to the failure, and a reading of 76/80 was obtained which was considered acceptable. There were no indications of similar failures recorded in the engine log book.

CONCLUSIONS:

Findings:
1. Shortly after take-off, at an altitude of about 250 feet, the engine suddenly lost power.

2. The engine lost power and stopped when the number three cylinder head failed because of high-cycle fatigue.

3. The pilot was unable to carry out a successful forced landing because of obstructions.

Causes:
The engine stopped because the number three cylinder head failed in fatigue.

CESSNA 182 SKYLANE C-GBJP
GANANOQUE, ONTARIO 5 mi S
30 JANUARY 1988

BRIEF NUMBER: 88-O/0035 (Accident)
LOCAL TIME: 1015 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,000	500
LAST 90 DAYS	10	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot landed the wheel-equipped aircraft on an ice-covered river and taxied beyond the landing area to pick up a passenger. After the passenger got into the aircraft, the pilot started to taxi toward the landing area; however, the aircraft broke through the ice and sank in 10 to 15 feet of water. Both occupants safely evacuated the aircraft before it sank. There was no indication that there was an area of weak ice.

CESSNA 180J SKYWAGON C-GCAJ
FAIRVIEW, ALBERTA 8 mi SE
18 FEBRUARY 1988

BRIEF NUMBER: 88-W0035 (Accident)
LOCAL TIME: 1835 MST
OPERATION: Private Other
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	700	550
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was attempting to take off from his snow-covered farm strip. He selected 20 degrees of flap and, during the take-off run, pushed forward on the control column to raise the tail. The tail came up suddenly, and the wheels sank into the snow. The aircraft veered left, ran off the side of the runway, and nosed over.

Concerned about the condition of the runway, because of above freezing temperatures, the pilot had rolled the strip earlier in the day and postponed his departure until just before dark.

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CESSNA 150M C-GWOJ
WILLIAMS LAKE, BRITISH COLUMBIA 30 mi ESE
18 FEBRUARY 1988

BRIEF NUMBER: 88-P0027 (Accident)
LOCAL TIME: 1523 PST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,800	1,500
LAST 90 DAYS	30	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot departed on a visual flight rules (VFR) flight from Kamloops direct to Williams Lake, British Columbia. After departure, because of low ceilings, he chose to follow an established VFR valley route via Cache Creek and Clinton. En route, the pilot, noting that the fuel gauges indicated less fuel than he had expected, planned a fuel stop at 100 Mile House, approximately 40 miles from destination. The pilot was unable to find the airport because ceilings were approximately 100 to 300 feet above ground level, and he chose to proceed direct to Williams Lake using the Williams Lake non-directional beacon for navigation.

The engine stopped because of fuel exhaustion, approximately 30 miles east-southeast of Williams Lake. The aircraft was force- landed in a small snow-covered clearing and nosed over.

The pilot had visually inspected the fuel tanks prior to departure. He had estimated they were approximately half full and considered this amount adequate for the flight plus a 45-minute reserve. His actual routing was considerably longer than the direct route.

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CESSNA 414A C-FTEC
VERNON, BRITISH COLUMBIA
20 FEBRUARY 1988

BRIEF NUMBER: 88-P0028 (Accident)
LOCAL TIME: 0835 PST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,500	1,000
LAST 90 DAYS	45	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	5

REPORTED CIRCUMSTANCES:

The pilot applied maximum power and commenced the take-off roll into a five-knot wind on runway 05. Two thousand feet down the runway, he rotated at an indicated airspeed of approximately 100 knots. At approximately five feet above ground, the pilot felt the aircraft buffet, and, with less than 1,000 feet of the 3,100-foot runway remaining, he reduced power to idle and, on touchdown, applied maximum braking. As the aircraft

approached the overrun area, the pilot turned right to avoid obstructions. The nosewheel contacted a rut, and the nose landing gear failed in overload.

Hoar frost had accumulated on the aircraft overnight, and the pilot had cleaned the frost from the aircraft before take-off. However, as the temperature was near freezing, moisture left on the tail and wings may have refrozen, thus affecting the aircraft's take-off performance. The pilot had aborted the take-off because he thought the aircraft was going to stall once out of ground effect.

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TAYLORCRAFT BC 12D C-FZMP
LIBAU, MANITOBA
20 FEBRUARY 1988

REPORT NUMBER: 88-C0035 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1600 CST
OPERATION: Private Recreational
DAMAGE: Minor
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	184	73
LAST 90 DAYS	6	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

Approximately one hour after take-off, the engine began running rough. The pilot applied carburettor heat, checked switch positions, and decided to return to base. Suddenly, the propeller sheared away from the engine and fell to the ground. The pilot conducted a successful forced landing without further incident.

Teardown of the aircraft engine (Continental C-85-12 F) revealed that the engine crankshaft had broken into four parts. The crankshaft had failed at the number four connecting rod journal, the intermediate crankshaft journal, and the forward main crankshaft journal. Metallurgical examination indicated that the number four rod journal had been previously repaired using a welding and grinding process. A crack, created by the welding, resulted in a fatigue failure at this repair. This initial failure caused a rapid fatigue failure of the intermediate journal.

The buildup of worn crankshaft journals by welding and grinding is not an approved repair process for crankshaft components installed in aircraft engines. The automotive industry developed this procedure as a method of regaining tolerances on excessively worn automotive crankshafts.

Inspection of the technical history of the aircraft indicated that the engine had not been overhauled since importation into Canada in 1970. The hours flown since new are unknown, but 573 hours were recorded since the engine was installed, after overhaul, in the United States. Technical records for that overhaul were not available.

A propeller strike in 1981 necessitated the installation of a new propeller. This was installed with an unapproved three-inch spacer between the propeller and the crankshaft flange. There were no entries in the technical logbooks regarding this installation.

The unapproved repair work in the number four rod journal resulted in a crack and subsequent failure at the repair location. This led to the failure of the intermediate journal, and, as a result of severe crankshaft misalignment, the number three piston and connecting rod jammed. The inertia of the propeller acting against the jammed crankshaft resulted in an instantaneous failure of the forward main journal. This section of the crankshaft, with the propeller attached, was forced forward through the nose case of the engine as propeller rotation caused the spiral-shaped fracture faces to collide.

The propeller strike and the unapproved installation of the propeller spacer did not cause the crankshaft failure; however, forces applied as a result may have accelerated the progression of the fatigue crack in the number four rod end journal.

CONCLUSIONS:

Findings:

1. The crankshaft was repaired using an unapproved welding and grinding process.

2. The number four rod end journal failed as a result of a crack created by the welding process.

3. The failure of the rod end journal resulted in catastrophic failure of the crankshaft assembly and subsequent separation of the propeller/crankshaft flange assembly.

4. Forces applied to the crankshaft, as a result of a previous propeller strike, and the installation of an unapproved propeller spacer may have contributed to a faster rate of fatigue propagation in the rod journal.

Causes:
The propeller assembly separated from the crankshaft as a result of fatigue failure of the number four rod end journal of the engine crankshaft. A crack resulting from an unapproved welding process initiated the fatigue failure.

CESSNA 150M C-GWDV
QUILL LAKE, SASKATCHEWAN 12 mi N
27 FEBRUARY 1988

BRIEF NUMBER: 88-C0038 (Accident)
LOCAL TIME: 1645 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	69	69
LAST 90 DAYS	8	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was taxiing to the parking area after landing on his farm strip. The surface winds were gusting between 20 and 25 knots. As the aircraft was turning down a tree-lined lane, the right main wheel sank into packed snow. Just as the aircraft stopped, a strong gust of wind blew it over.

CHAMPION 7ECA CITABRIA C-FUZF
BALMORAL, MANITOBA 6 mi E
27 FEBRUARY 1988

REPORT NUMBER: 88-C0042
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1215 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	15,500	22
LAST 90 DAYS	7	7

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	1	-	-

HISTORY OF THE FLIGHT:

The pilot and his neighbour took off from a farm strip for a local flight to search for the neighbour's missing dog. Nothing further was heard from the aircraft. Approximately one hour after the aircraft took off, an ELT signal was received by a military aircraft. The aircraft wreckage was located in an open field approximately one and one-half miles from the point of departure. Both occupants were killed in the accident.

PERTINENT INFORMATION:

The wreckage pattern was confined to a small area. The aircraft was in a nose-down, 60-degree-right-bank attitude when it struck the ground. The right wing tip struck first, then the aircraft cartwheeled over to the left wing and came to rest 80 feet from the initial point of ground contact. The wreckage trail was oriented in a south to north direction and was near an area of scrub bush six to seven feet high. There were no witnesses to the accident.

The technical log books were examined, and no discrepancies were found. The weight and centre of gravity were within the prescribed limits. The control system was examined, and all control cables were found attached and the controls functioned normally. The trim system was serviceable. This model of the aircraft is not equipped with flaps. The wings were removed and thoroughly examined in a workshop; no evidence of pre-impact damage was found. The engine was disassembled and found to be capable of producing power. Fuel samples taken at the accident site were clear and uncontaminated. Propeller damage indicated that the engine was producing power at impact.

The pilot's operating manual states that the aircraft stall characteristics are conventional, with sufficient aerodynamic buffeting preceding the stall to provide adequate warning to the pilot. Aileron control response in a fully stalled condition is marginal. Large aileron deflections will aggravate a near stalled condition, and the use of ailerons to maintain lateral control is not recommended.

There were high scattered clouds, good visibility, and strong gusty winds in the area. Fifteen minutes prior to the accident, the weather reported at Winnipeg, located 20 miles south of the accident site, was scattered cloud at 29,000 feet, visibility 15 miles, temperature one degree Celsius, dew point minus three degrees Celsius, and the wind 190 degrees true at 11 knots gusting to 17. The temperature and dew point conditions were conducive to carburettor icing.

The pilot was a highly experienced aviator who had retired from a major airline about a year and a half prior to the accident. He had purchased the aircraft the previous year and had logged a total of 21.6 flight hours since that time, all in this aircraft. The autopsy and toxicology tests did not reveal any evidence of pilot incapacitation. The pilot was suffering from a head cold, and his doctor had prescribed an antibiotic to help relieve the symptoms; the drug does not cause drowsiness or otherwise affect a pilot's ability to fly.

ANALYSIS:

The attitude of the aircraft at impact and small wreckage pattern indicated that the aircraft was in a stalled condition when it struck the ground.

There was no evidence of any aircraft malfunction, and, while conditions conducive to carburettor icing conditions were present, the aircraft had already flown for approximately one hour without difficulty. Furthermore, had icing affected engine performance, it is highly improbable that the pilot, given his experience, would not have been able to take appropriate action.

It is assumed that the aircraft was flying relatively low to the ground while searching for the dog. As the wreckage was near the scrub bush, it is possible that the pilot may have overflown the bush and turned back to obtain a better view and, in so doing, stalled the aircraft. If the pilot used aileron to assist in recovery, this would have aggravated the stall. The strong winds would have produced turbulent flight conditions which could have made recovery from the stall more difficult. However, the evidence available was such that it was not possible to determine why the aircraft stalled.

CONCLUSIONS:

Findings:
1. The aircraft stalled at an altitude from which recovery was not possible.

Causes:
The aircraft stalled for undetermined reasons.

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LAKE LA-4-200 BUCCANEER C-GPLI WILLIAMS LAKE AIRPORT, BRITISH COLUMBIA 24 JULY 1987

REPORT NUMBER: 87-P70054 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1209 PDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,000	600
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	2	-

SUMMARY REPORT:

The Lake Buccaneer aircraft, with the pilot and two passengers on board, departed 100 Mile House at approximately 1115 Pacific daylight time (PDT) on a pleasure flight. Following an uneventful flight to Williams Lake to refuel, the aircraft landed on a grass strip adjacent to the main runway, which was being resurfaced. When refuelling was completed, the pilot reported to the Williams Lake Flight Service Station (FSS) that he was taxiing for take-off, and he was informed by the FSS that there was another aircraft in the circuit that would soon be landing. The pilot informed the FSS that he was ready for an immediate departure, taxied onto the grass runway, and began the take-off roll. The pilot reported that the aircraft acceleration was sluggish and that, after it became airborne, it would not climb. He also reported that he did not land straight ahead because it would have endangered the construction crew that was working there. As the aircraft passed over the departure end runway lights, the pilot noted trees ahead too tall for the aircraft to clear, and he decided to turn to the left in an attempt to return to the airport. In the turn, the aircraft descended until the left wing tip hit a tree, swinging the aircraft to the left. The aircraft then hit the ground and skidded for 119 feet before it nosed over. During the ac-

cident sequence, the aircraft was destroyed, and the pilot and passengers were seriously injured, requiring hospitalization over 48 hours.

The pilot was licensed and experienced on type. He did not use a check-list but did his cockpit checks from memory. He reported that he normally left the flaps down after landing and thus did not have to worry about them being down for the next take-off. He reported that he did not raise the flaps after the last take-off, prior to colliding with the tree.

Post-crash examination revealed that all the aircraft systems were serviceable prior to take-off. The aircraft's weight and centre of gravity were within the specified limits.

The Lake Buccaneer has a two-position hydraulically operated flap system which positions the flaps either fully up or fully down. The post-crash examination revealed that the left flap inboard end had been pushed back during the accident and had indented the fuselage in a position that indicated the flap was up at the time of the accident. While the aircraft is capable of take-off and climb with flaps up, the climb performance will be reduced at normal take-off speeds, and the manufacturer recommends that the flaps be used for all take-offs and landings.

The 1200 PDT weather observation at Williams Lake, nine minutes before the accident, was scattered cloud at 6,000 feet above ground level, 15 miles visibility, temperature 26 degrees Celsius, and calm wind.

The Williams Lake Airport elevation is 3,085 feet above sea level (asl). On the day of the accident, the asphalt runway 11/29 was closed for resurfacing. A 2,500-foot-long grass area adjacent to the touchdown zone on the south side of runway 11 was being used as a grass runway, and the construction crew and equipment were approximately 1,000 feet beyond the end of the grass strip.

The temperature and runway elevation were plotted on the Koch chart in the Canada Flight Supplement, and the results indicated that there would be 78 per cent increase in take-off distance and a 48 per cent decrease in the rate of climb for take-off under the prevailing conditions.

The pilot usually did all cockpit checks from memory and used set procedures to reduce his memory load. Since flaps are recommended for all take-offs and landings, one of these procedures, when on a short stopover between flights, was to leave the flaps down after landing so that, on the following take-off, he would not have to check the flap position. On the accident flight, however, the flaps were probably raised after landing to protect them from debris thrown up by the wheels.

Following refuelling and engine start, the pilot employed his usual memory checks and, as a result, omitted to lower the flaps before take-off. This combined with the high density altitude reduced the aircraft's climb performance to the extent that it was unable to clear the tall trees at the end of the runway.

CONCLUSIONS:

Findings:

1. The pilot usually left the flaps in the down position on short refuelling stops.

2. Following this landing on the grass strip, the pilot probably raised the flaps to prevent damage.

3. The pilot did not use a before-take-off check-list and took off with the flaps in the up position, contrary to the manufacturer's recommendation.

4. The aircraft's climb performance was greatly reduced during the take-off and climb because the flaps were up and the density altitude was high.

Causes:

The pilot attempted a take-off with an improper flap setting.

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CITABRIA 7GCBC CF-QKY
LAC MASKINONGÉ, QUÉBEC
26 JULY 1987

BRIEF NUMBER: 87-Q70032 (Accident)
LOCAL TIME: 1240 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	700	N/A
LAST 90 DAYS	60	45

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was taxiing the aircraft downwind on a large lake when the strong wind became gusty. The pilot attempted to turn into the wind to ride out the gust when, half-way through the turn, the left wing lifted. The pilot used aileron control and power to complete the turn but

was unable to hold the wings level. The right wing struck the water, and the aircraft nosed over.

The winds were gusting to 30 miles per hour.

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CESSNA 180 SKYWAGON C-FHGO
ST-IGNACE-DE-LOYOLA, QUÉBEC
26 JULY 1987

BRIEF NUMBER: 87-Q70031 (Accident)
LOCAL TIME: 929 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	292	15
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The wind was calm on the return pleasure flight. The float-equipped aircraft was approaching the landing point, at a height of about four feet above the water, when the pilot noticed a floating log. To avoid the obstacle, the pilot banked the aircraft to the right. During the manoeuvre, the right float, then the wing tip touched the water. The pilot tried unsuccessfully to level the aircraft; the aircraft nosed down, overturned and sank. The pilot and passenger escaped from the aircraft uninjured.

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CESSNA U206G C-GVYV
LAC KAIAGAMAC, QUÉBEC
27 JULY 1987

BRIEF NUMBER: 87-Q70033 (Accident)
LOCAL TIME: 1145 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	734	431
LAST 90 DAYS	35	35

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot and his passenger were taking off from a lake. The wind was gusting to about 30 knots, producing two-foot waves. Shortly after the into-wind take-off, at an altitude of approximately 20 feet, the aircraft lost height. The right wing and right float struck the water, causing the aircraft to yaw uncontrollably to the right. Shortly thereafter, the left wing and propeller contacted the water, and the aircraft flipped over onto its back and sank. Both passengers escaped without serious injuries.

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CESSNA 206T STATIONAIR N9315Z
NANAIMO, BRITISH COLUMBIA
31 JULY 1987

BRIEF NUMBER: 87-P70906 (Accident)
LOCAL TIME: 1513 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6,915	875
LAST 90 DAYS	37	37

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	5

REPORTED CIRCUMSTANCES:

The pilot of the float-equipped aircraft was taking off from Departure Bay and was travelling at about 15 knots when a fishing boat cut across his path from the

left. The pilot intentionally swerved to the right, and the aircraft collided with a channel marker buoy; the right wing and float were damaged.

The channel marker could not be seen from the pilot's seat on the left side of the aircraft as the aircraft was in a nose-high attitude.

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CESSNA 172B SKYHAWK C-FNIC
ATLIN LAKE, BRITISH COLUMBIA
01 AUGUST 1987

BRIEF NUMBER: 87-P70062 (Accident)
LOCAL TIME: 1540 PDT
OPERATION: Private Training
DAMAGE: Minor
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	119	119
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was on a supervised solo training flight in preparation for a float endorsement and was practising glassy-water landings near the lake shore, in calm wind conditions. During his third approach, near the water surface, he allowed an excessive nose-high attitude to develop, and the aircraft began to mush. The pilot eased forward on the elevator control and applied power. The aircraft touched down on the right float and veered toward the shore in a right-wing-low attitude. The pilot applied full left rudder and rapidly reduced power. The left float then contacted the water, and the aircraft continued to roll to the left until the left wing tip touched the water, bending the left aileron and wrinkling the wing tip skin.

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REPUBLIC RC3 SEABEE C-FDJV
TYAUGHTON LAKE, BRITISH COLUMBIA
06 AUGUST 1987

REPORT NUMBER: 87-P70064 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1500 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	695	109
LAST 90 DAYS	31	22

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was returning to Tyaughton Lake after a local flight. He made a normal landing and taxied the aircraft to the shore at a higher than normal speed. The aircraft stopped on the beach with its nose high in the air and its tail partially submerged in the water. Approximately 50 minutes later, in preparation for take-off, the pilot pumped the water out of all the compartments of the hull, except the very aft compartment which is self-draining through two quarter-inch holes. He then pushed the aircraft off the beach, with the assistance of several people, and taxied to the north end of the lake for take-off. He turned the aircraft into wind and commenced the take-off run but rejected the take-off when he could not get the aircraft on the step. He attempted another take-off, but was again unsuccessful. During the third attempt, the aircraft became airborne, but, shortly after lift-off, it began to porpoise, The pilot had to push the control column fully forward and apply more than usual nose-down trim to control the aircraft. At this point, the pilot decided to carry out a precautionary landing, and, when he reduced engine power, the nose of the aircraft pitched up. To avoid landing too close to a boat, the pilot increased engine power again and continued flying 50 to 75 feet above the lake surface. As he approached a turn in the lake, he reduced engine power to idle. The nose of the aircraft pitched up again, the aircraft stalled, and the right wing dropped. The aircraft then rolled to the right and struck the water in a nearly inverted attitude. The pilot was seriously injured but was able to free himself from his seat-belt; he then clung to the partially submerged aircraft and was rescued.

The weather was suitable for the intended flight, and the wind was less than five knots from the south. Tyaughton Lake, which is oriented north and south, is 3.5

kilometres long and has a dogleg to the northeast, about 1.6 kilometres from its northern end.

The aircraft was recovered and examined in detail. No failures or malfunctions were detected, but a bird's nest in the elevated aft section of the fuselage covered the only drain hole in that area. It was also found that a permanent ballast weight of 56 pounds, required to be in place in the anchor well in the nose of the aircraft to meet the weight and balance requirements, was not installed. The centre of gravity (C of G) at the time of the occurrence was estimated to have been more than five inches aft of the rear limit.

While the aircraft was beached at Tyaughton Lake, its tail was under water; as a result, water was able to enter the aft compartment of the hull and the rear elevated section of the fuselage, through the drain holes. Water in those two areas cannot be pumped overboard but must drain through the drain holes. It is likely that the bird's nest prevented proper drainage of the trapped water from the rear elevated section of the fuselage. The weight of the water remaining in the rearmost section of the aircraft and the absence of the permanent ballast in the nose section of the aircraft created an aft C of G condition which significantly altered the flying characteristics of the aircraft. Once the aircraft was airborne, the pilot, even though he used nose-down trim and pushed the control column forward, was not able to control the pitch attitude of the aircraft, and, when he reduced engine power in preparation for landing, the aircraft stalled.

CONCLUSIONS:

Findings:

1. The aircraft was beached in such a way that water entered the aft compartment of the hull and the rear elevated section of the fuselage.

2. Water in these areas cannot be pumped overboard but must drain through the drain holes.

3. A bird's nest covered the only drain hole in the rear elevated section of the fuselage.

4. The trapped water in the rear elevated section of the fuselage resulted in the C of G being more than five inches aft of the rear limit.

5. The permanent ballast of 56 pounds in the nose of the aircraft, which is required to keep the C of G within limits, had not been installed.

6. The aircraft stalled when power was reduced for the precautionary landing.

Causes:

The pilot did not ensure that water had been drained out of the rear section of the fuselage before flight.

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CESSNA 180F CF-PGI
HORSE LAKE, BRITISH COLUMBIA
06 AUGUST 1987

REPORT NUMBER: 87-P70063
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1725 PDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	320	141
LAST 90 DAYS	29	29

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	1	-	-

HISTORY OF THE FLIGHT:

The pilot and one passenger departed Horse Lake, British Columbia on a visual flight rules (VFR) flight to Savory Island, British Columbia. The take-off was normal until the aircraft reached the end of the lake, when at a height of about 350 feet above ground level (agl), the engine was heard to splutter and lose power. As the aircraft commenced a turn to the right, the engine regained power, and the aircraft then continued back on course. About one-half mile further on, the engine again lost power, and the aircraft once more commenced a right turn. As the aircraft turned, the nose suddenly pitched down, and the aircraft spun to the ground. The aircraft was consumed by post-impact fire, and both occupants were fatally injured.

PERTINENT INFORMATION:

The weather at the time of the accident was suitable for VFR flight.

The aircraft was kept at a small dock on the southern shore of Horse Lake. In order to refuel the aircraft at the lake, the pilot kept a 45-gallon drum in the open back of his pickup truck. Two days before the final flight, he had refilled this drum at the local airport and later that evening had refuelled the aircraft to capacity from the drum. On that day, it had rained heavily. The fuel was hand-pumped from the drum into two 5-gallon plastic

containers which the pilot then poured into the aircraft fuel tanks; there was no filter on the pump. Later examination of the fuel drum revealed that the cap was on finger tight only, and, by tilting the drum slightly, water could be pumped out of the bottom of the drum. Each of the plastic containers also contained small amounts of water.

It could not be ascertained if the pilot had checked the aircraft fuel drains for contamination before the final flight, but it was his habit to do so. In 1985, the fuel cells were inspected for wrinkles in accordance with Airworthiness Directive 84-10-01, and none were found. All the components of the fuel system, except the carburettor, were destroyed by the post-impact fire. The carburettor was recovered and was found to be full of water. No other pre-impact defects were found that would have contributed to the accident.

The crash occurred in the middle of a farmer's field about one-half mile from the lake. There were no major obstructions in the surrounding fields except for irrigation water lines that crossed the fields at regular intervals.

ANALYSIS:

It is known that, two days before the accident, the pilot took his pickup truck to get fuel for the aircraft. It is possible that, if the cap on the drum was not on tight, water could have entered the drum during the rain showers that day because the lip around the drum circumference was higher than the fuel cap on the top of the drum. As there was no filter on the fuel hand-pump, this water could then have been transferred to the aircraft without the pilot's knowledge.

It is likely that the pilot checked the fuel drains before departure but may not have found any significant amount of water. Although the fuel bladders had been inspected two years before, it is also possible that wrinkles in the bottom of the fuel bladders could have retained the water; however, as both fuel tanks were destroyed in the crash this could not be determined.

After take-off at a height of about 300 feet, sufficient water reached the carburettor to cause the engine to sputter and lose power. This was the first indication that the fuel was contaminated with water. As the pilot commenced a turn to the right, the engine regained power, and the pilot turned back on course. Within a half-mile, the engine once again lost power due to water contamination. As the pilot entered another right turn, the airspeed was allowed to decrease to the point where the aircraft stalled, then pitched nose-down, and entered a spin. There was insufficient altitude in which to recover before the aircraft struck the ground in a nearly vertical attitude.

It is probable that the pilot was attempting to return to the lake on both occasions when the engine lost power. There were fields ahead and on either side of the aircraft which would have been more suitable for a forced landing as he was too far from the lake and at too low an altitude for a successful return attempt.

CONCLUSIONS:

Findings:

1. The pilot refuelled the aircraft from a water-contaminated drum of fuel, without using of a filter or water trap.

2. The engine lost power due to water in the fuel.

3. The pilot did not maintain flying speed in the turn, and the aircraft stalled at too low an altitude to permit recovery.

Causes:

The engine lost power due to water-contaminated fuel, and the aircraft crashed because the pilot did not maintain flying speed during the subsequent turn.

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AERONCA 15AC CF-IZM
SUTTON RIVER, ONTARIO
13 AUGUST 1987

BRIEF NUMBER: 87-O/70061 (Accident)
LOCAL TIME: 1620 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,200	1,500
LAST 90 DAYS	70	70

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot, with a passenger on board, took off from the Sutton River to fly to Moosonee. The aircraft climbed to about 200 feet above the surface of the river, and the pilot executed a steep turn to the left. When the aircraft was in the cross-wind portion of the turn, the nose

dropped, and thee aircraft struck the ground near the edge of the river.

Prior to this flight, the pilot had attempted to take off with a damaged float. The float was taking on water, and the take-off was aborted. The aircraft was pulled up on the shore, and temporary repairs were carried out which allowed the aircraft to become airborne. It was calculated that the aircraft was at or near its maximum gross weight at the time of the accident. The ELT was reportedly found to be in its shipping package under the front seat and had not been switched to the ARMED position. Nearby fishermen who witnessed the accident were able to assist the pilot and passenger who, although not seriously injured, were suffering from shock, cuts, and bruises.

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CESSNA A185-F C-GYZW
BOUCHERVILLE, QUÉBEC
24 AUGUST 1987

REPORT NUMBER: 87-Q70037 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1012 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,300	110
LAST 90 DAYS	28	28

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot, accompanied by a passenger, was landing his float-equipped aircraft on a body of water, approximately 1,000 feet wide and over 6,000 feet long, oriented in a north/south direction. The aircraft was landed heading south with 30 degrees of flap extended. After landing, the left wing contacted the water, and the aircraft flipped over and sank; both occupants escaped without injuries.

There were no indications of any pre-crash aircraft malfunctions or failures, and the weight and centre of gravity of the aircraft were within the prescribed limits. The weather at the time of the accident was suitable for visual flight rules (VFR) flight. The wind, reported by a nearby control tower and passed to the pilot prior to landing, was from the west at 16 gusting to 23 knots; the maximum demonstrated cross-wind velocity in the Cessna A185-F operating handbook is 15 knots. After touchdown, the right wing rose uncontrollably, causing the left wing to contact the water; the aircraft then nosed over.

The pilot lost control of the aircraft after it was landed in cross-wind conditions that exceeded the aircraft's maximum demonstrated cross-wind velocity. The use of 30 degrees of flap on landing aggravated the aircraft's post-touchdown handling characteristics in the strong cross-wind conditions.

FINDINGS:

Cause Related:
1. The pilot lost control of the aircraft, and it flipped while landing in cross-wind conditions exceeding the aircraft maximum demonstrated cross-wind velocity.

Other:
- Nil -

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CESSNA A185-F SKYWAGON C-GYJA
LAC BÉRARD, QUÉBEC
29 AUGUST 1987

BRIEF NUMBER: 87-Q70040 (Accident)
LOCAL TIME: 1630 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	201	50
LAST 90 DAYS	25	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot and his passenger were returning to their camp after a day fishing trip. The weather at the time of the accident was adequate for visual flight rules (VFR) flight. The aircraft was landed into a steady 10-knot wind. The float plane touched down, bounced once, nosed over and sank. Both occupants escaped without injury.

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CESSNA 172I C-GSDU
GULL WING LAKE, ONTARIO
29 AUGUST 1987

BRIEF NUMBER: 87-C70069 (Accident)
LOCAL TIME: 1615 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	234	75
LAST 90 DAYS	33	33

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

While on a visual flight from McCrea Lake to Dryden, Ontario, the pilot encountered a thunderstorm and decided to land the float-equipped aircraft on a nearby lake. After landing on the rough lake surface, strong winds rolled the aircraft over as it crested on a large wave.

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LAKE LA-4-200 BUCCANEER C-FTCX
STEPHENVILLE AIRPORT, NEWFOUNDLAND
30 AUGUST 1987

REPORT NUMBER: 87-A70029 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1118 NDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,019	647
LAST 90 DAYS	16	16

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The pilot was taking off on runway 10 at Stephenville Airport, Newfoundland, on a return flight to Pinchgut Lake after flying to Stephenville to refuel. After take-off, the aircraft was observed to climb quickly to about 200 feet above ground level (agl), where, following a slight power reduction, the engine (Lycoming IO-360-AIB) began to misfire and run rough.

The sound of misfiring continued for several seconds, and the aircraft was seen to level off at 300 to 400 feet agl. The engine then became very rough-sounding, and the aircraft began a gradual descent. The aircraft then rolled to a steep angle of bank to the left, suddenly pitched to a steep nose-down attitude, and dived to the ground. The aircraft was severely damaged by the impact forces. The pilot was fatally injured.

PERTINENT INFORMATION:

The surface wind at the time of the accident was from the southwest at about six knots, giving the pilot a tail wind. The pilot took off from runway 10, which is 10,000 feet long, starting his roll at the threshold. The aircraft crashed in the infield, 500 feet left of the runway centre line, 7,700 feet from the threshold, on a heading about 90 degrees to the left of runway heading. When the engine started to run rough, the aircraft was about 5,000 feet from the threshold.

After take-off, the pilot made a short radio transmission in which he started to describe a malfunction. During this transmission, the aircraft stall warning horn was sounding.

After the accident, the engine was examined; the injector pump fuel inlet screen was found to be corroded into the fitting, and corrosion was found on the downstream side of the screen.

The engine was run up in a test cell. At 2300 rpm, as the throttle was advanced toward full power, the engine became rough and slowed down to 1500 rpm. The fuel nozzles were removed, and a fuel flow check was carried out. The fuel flow from the number two nozzle was spurting to one side. The number one nozzle tested at between 19.8 pounds per hour (pph) and 10 pph. The number four nozzle tested at 30 pph, but the flow was streaking. The normal specification calls for 32 pph plus or minus 2 pph. New fuel nozzles were installed, and, when the engine was run up to full throttle, it performed within normal parameters.

The nozzles from the number one and four cylinders, along with the fuel inlet screen from the fuel injector pump, were examined by the CASB Engineering Laboratory. No contamination was found in the nozzle from the number four cylinder. Contamination, consisting of various elements, with aluminum being the major element, was found in the nozzle from the number one cylinder. A corrosion sample scraped from the downstream side of the fuel inlet screen contained aluminum in conjunction with other elements similar to those which

were found in the number one cylinder nozzle. The size and fragility of the contaminant makes it highly unlikely that it formed upstream of the screen and then passed through it; therefore, the contamination most likely formed and accumulated downstream of the screen.

Samples of fuel were taken from the aircraft and sent to the CASB Engineering Laboratory for analysis; the fuel met the specification requirements for aviation gasoline, and no contaminents were detected.

The aircraft's weight at the time of the accident was within the prescribed limit, and the centre of gravity was 0.75 inches aft of the rear limit. It was determined that the flaps were in the UP position on impact.

The pilot had completed his private pilot licence training in 1977. His company purchased this aircraft in July of 1983, and he had flown it regularly since then, averaging about 160 hours per year. After the initial check-out on this aircraft, no record of any refresher training could be found in the pilot's personal log book or the aircraft journey log book.

The owner's manual for this aircraft recommends that all take-offs be conducted with flaps down, and the accident pilot was known to follow this procedure, retracting the flaps shortly after take-off. The power-off stall speed of the aircraft is 45 mph with flaps down and 52 mph with flaps up, and the stall speeds are the same with power on. Recommended climb speeds are 65 to 70 mph with flaps down and 75 to 80 mph with flaps up. In this aircraft, the high thrust line from the overhead mounted engine causes the nose to have a tendency to pitch down when power is added and to pitch up when power is reduced.

An emergency locator transmitter (ELT) was found in the cockpit area of the wreckage. It had not been mounted in the required manner in the aircraft and did not have an antenna attached, nor had it been armed.

The crash was first reported to the flight service station (FSS) operator by another pilot who was holding short of the runway near to where the aircraft crashed. At Stephenville Airport, the FSS is located in such a position that the FSS personnel cannot see the airport.

ANALYSIS:

When the engine was run in the test cell, it produced the same symptoms that were observed by the witness just before the airplane crashed. The laboratory reports indicated that the rough running and partial power loss were caused by corrosion product migrating from the downstream side of the fuel injector pump fuel inlet screen and lodging in the engine fuel injectors.

The power loss occurred at a critical time, just after take-off, as the aircraft was climbing through 300 feet agl. Proficiency in dealing with emergencies such as this requires frequent and current training, and there was no evidence that the accident pilot had received such training.

At the time of the engine failure, there were many factors contributing to the aircraft stalling:

a) The loss of thrust which would tend to make the aircraft's nose pitch up, reducing the airspeed;

b) The retraction of the flaps shortly after take-off which would increase the stall speed;

c) The steep angle of bank which would increase the stall speed;

d) The tail wind which would give the pilot the illusion of greater speed.

These factors, together with the pilot's low level of proficiency in emergency procedures, contributed to the situation in which the pilot allowed the aircraft to stall when he attempted to maintain altitude and turn back for landing.

A rapid response to on-field emergencies at Stephenville Airport could be affected by the inability of FSS personnel to see the airport from their office.

CONCLUSIONS:

Findings:

1. The downstream side of the fuel injector pump fuel inlet screen was found to be corroded.

2. Particles of this corrosion product migrated and lodged in the fuel injector nozzles, causing the engine to run rough and lose partial power.

3. When the engine lost power, the pilot attempted to turn back toward the runway.

4. The pilot did not recognize that the airspeed was decreasing and stalled the aircraft.

5. The aircraft centre of gravity was .75 inches aft of the prescribed limits.

6. At about 300 feet agl, the aircraft entered a deep, power-on stall from which the pilot was not able to recover before the aircraft struck the ground.

7. There was no evidence the pilot had received any recent emergency procedures training.

8. FSS personnel at Stephenville Airport cannot see the airport from the FSS office.

9. The ELT was not mounted in the aircraft in the required manner, had no antenna attached, and was not armed.

Causes:
Contamination in the fuel injector nozzles caused the engine to lose power.

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CESSNA A185F SKYWAGON C-GCAR
LAC DUMOINE, QUÉBEC
31 AUGUST 1987

REPORT NUMBER: 87-Q70041 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1500 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	210	31
LAST 90 DAYS	14	14

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot of the Cessna 185 amphibious aircraft selected 20 degrees of flaps and departed from Lac Dumoine, Québec, for a flight to Barry's Bay, Ontario. During the climb, the pilot maintained an indicated airspeed (IAS) of 59 mph. The pilot, realizing that the aircraft was not going to clear trees ahead, started a left turn to return for landing; however, the aircraft stalled and crashed into the trees. The pilot and the passenger escaped uninjured.

The pilot reported that, after take-off, the aircraft did not climb normally. An examination of the aircraft revealed that there were no mechanical defects that contributed to the accident; however, the floats were found to contain about 100 pounds of water. Before the flight, the pilot did not calculate the aircraft's weight and balance; it was determined after the accident that the aircraft's weight at take-off had exceeded the maximum permissible weight by approximately 300 pounds. Although the pilot pumped out the floats prior to take-off, approximately 10 gallons of water remained in the right float.

The operator's manual recommends that the best angle of climb speed for this seaplane is 64 mph IAS. The aircraft departure path was approximately 4,700 feet long and was bordered by rising terrain to the left and lower terrain to the right.

The aircraft's climb performance after take-off was reduced because the aircraft was overloaded and because it was not flown at the best angle of climb airspeed. The pilot turned at low airspeed and altitude toward rising terrain, and the aircraft stalled into the trees.

FINDINGS:

Cause Related:
1. Approximately 10 gallons of water was found in the floats despite the pilot's draining them prior to take-off.

2. The aircraft was approximately 300 pounds over the maximum take-off weight.

3. The aircraft was not flown at the best angle of climb airspeed.

4. The pilot did not reject the take-off.

5. While attempting to clear trees, the pilot turned toward rising terrain and away from lower terrain.

6. The pilot banked the aircraft at low airspeed, causing the stall speed to increase and resulting in the aircraft stalling.

Other:
- Nil -

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CESSNA 172 C-FYOB
BAIE ADOLPHE-POISSON, QUÉBEC
02 SEPTEMBER 1987

BRIEF NUMBER: 87-Q70043 (Accident)
LOCAL TIME: 1500 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	270	270
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot, with one passenger on board his float-equipped aircraft, was bound for Baie Adolphe-Poisson from Gouin Réservoir, Québec. At destination, the pilot started the final approach with 15 degrees of flap selected. There was a head wind of approximately 15 knots. The landing distance available was about 2,500 feet.

There was a 50-foot-high obstacle in the vicinity of the lake, and there was a sandy beach at the other end. Immediately after the landing, the wind lifted the aircraft, which then landed again on the surface of the lake. The aircraft rose again; this time, it flew about five feet above the water, for a long moment, before landing. The pilot was unable to climb again because of the short distance in front of him. The aircraft touched down on the beach, at a speed of approximately 25 mph and nosed over. The two occupants exited uninjured; the aircraft was substantially damaged.

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PIPER PA-18A-150 SUPER CUB C-FLHP
MOUNT LLOYD GEORGE, BRITISH COLUMBIA
10 mi N
15 SEPTEMBER 1987

REPORT NUMBER: 87-P70079
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1350 PDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	330	148
LAST 90 DAYS	48	48

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The pilot and his companion, each flying a Super Cub, were on a hunting trip. After refuelling their aircraft at Brothers Lake, British Columbia, they departed for Tuchodi Lake, British Columbia. The two aircraft flying in loose formation, with the friend following a few hundred feet lower, proceeded uneventfully through Fox Pass and around Quienten Lake into the valley north of Mount Lloyd George. As they progressed toward the pass between the Warneford and Tuchodi Rivers, the two pilots were in constant radio contact comparing course information on their Loran C receivers.

The accident pilot, flying near the mountains on the right side of the valley, reported that he was going to climb a little more before turning right and flying through the pass. As the friend was approaching the pass, he lost sight of his companion and attempted to make contact with him by radio but was unsuccessful. He flew through the pass and, as he still could not contact his companion, continued to destination. Twenty-four hours later, when he still had not heard from his companion, he reported the aircraft as missing.

The accident aircraft was found the following day in the middle of the valley, approximately one mile west of the pass. It had crashed and burned, fatally injuring the pilot. The wreckage was located at an elevation of 5,600 feet asl.

PERTINENT INFORMATION:

At the time of this occurrence, there was a cold front approaching the area, creating unstable conditions. The air mass was moist, with 60 to 80 per cent relative humidity, and there was an overcast stratus layer at 6,000 feet asl. The freezing level was estimated to be 6,000 feet asl.

The aircraft struck the ground on a heading of 165 degrees magnetic (M) and came to rest on a heading of 185 degrees M. On impact, the propeller was parallel to the ground and the spinner was crushed on the underside. There was no evidence of propeller rotation at impact. The engine was burned but otherwise intact with only the oil pan cracked. The carburettor was torn off, and the air intake was crushed on ground impact. The pre-impact carburettor heat setting could not be determined. The engine was recovered and disassembled, and there were no mechanical malfunctions found.

An intense fuel-fed fire erupted after impact and consumed most of the right wing and right float. The extensive fire damage indicated that the aircraft contained a considerable amount of fuel; based on the fuel boarded at Brothers Lake and on the aircraft's normal fuel consumption, it was calculated that one wing fuel tank was full and the other tank was half full at the time of impact. The fire was ignited by the battery cable shorting on the rudder cable when the battery was thrown to the left upon ground impact.

The airspeed indicator (ASI), vertical speed indicator (VSI), turn and slip indicator, and engine tachometer were examined. The ASI and engine tachometer were not damaged by the impact but were burned and did not reveal any information as to their indications at the moment of impact. The VSI indicated that the aircraft was

descending at a rate of 1,000 feet per minute upon ground impact. The turn needle of the turn and slip indicator was fully deflected to the right when the aircraft struck the ground.

The Avco-Lycoming "Flyer" information circular states that "under moist atmospheric conditions, ice can form in the induction system of a carburettor with air temperatures ranging between 20 degrees Fahrenheit and 90 degrees Fahrenheit. The rapid cooling in the induction system of a float type carburettor can cause the temperature in the mixing chamber to drop by as much as 70 degrees Fahrenheit below the temperature of the incoming air. If the incoming air contains moisture, the cooling process can cause ice to form in the vicinity of the throttle plate and ice accumulation may cause engine stoppage."

The Carburettor Icing Probability Chart published in the Aeronautical Information Publication (AIP) Canada indicates that, under the prevailing weather conditions, serious carburettor icing was possible at any power setting.

The pilot was qualified on type and had flown only this aircraft in the previous two years. The autopsy and toxicology tests did not reveal any conditions which would have affected the pilot's performance.

ANALYSIS:

The evidence from the wreckage indicated that the engine had stopped in the air and that the aircraft stalled and spun to the right until ground impact. It is probable that the high moisture content of the air mass over the area created conditions conducive to serious carburettor icing, causing the engine to stop. However, the reason the pilot lost control of the aircraft after the engine stopped could not be determined.

The location of the wreckage in the middle of the valley, to the left of his original course, indicated that the pilot deviated from his stated intentions of making a right-hand turn to fly through the pass. The reason for this could not be determined because the pilot, contrary to established habit, had not communicated further with his companion.

CONCLUSIONS:

Findings:
1. Conditions in the air mass in the vicinity of the accident were conducive to carburettor icing.

2. The aircraft was in a spin to the right when it struck the ground.

3. The propeller was not rotating when the aircraft struck the ground.

4. The pilot deviated from his intended flight path and did not inform his companion.

Causes:
It could not be determined why the pilot lost control of the aircraft.

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CESSNA 180H C-FVUW
LA COREY, ALBERTA 16 mi NW
26 SEPTEMBER 1987

REPORT NUMBER: 87-W70065 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1430 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	225	40
LAST 90 DAYS	40	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot, with one passenger on board, was flying the float-equipped aircraft on the last leg of a trip that had started on 24 September 1987. The visual flight rules (VFR) flight was from Grist Lake to Manatokan Lake. About 10 minutes from destination and one and one-half miles after the aircraft had crossed over the east side of Corner Lake at 1,200 feet above ground level (agl), the engine sputtered and stopped. The pilot turned right in an attempt to return to Corner Lake, and, during this turn, he selected the left fuel tank and attempted to start the engine, but was unsuccessful. The aircraft was forced-landed in thick 40-foot poplar trees about 400 yards short of the lake.

The aircraft was equipped with long-range fuel tanks which held 84 U.S. gallons. The unusable fuel in this aircraft is 2.5 U.S. gallons per tank. Prior to the flight on 24 September 1987, the aircraft was refuelled from jerry cans into the left wing tank. The fuel selector was placed in the BOTH position, and, as the left tank was filled, the fuel ran down through the selector to the right tank to seek an equal level. No visual check was made of the right tank quantity after refuelling. The fuel selec-

tor was left in the BOTH position from the time the aircraft was refuelled until the engine stopped.

The total flight time for the entire trip, which included eight take-offs, was 4 hours and 50 minutes. On the last flight, the pilot and passenger noticed that the right fuel quantity indicator was fluctuating between empty and full and the left tank indicated one-quarter full.

At the accident site, the aircraft was suspended above ground in a level position; the left fuel quantity indicator showed just below one-quarter full, and the right one indicated about one-quarter full. The fuel tanks were drained; the left tank contained one-half of a U.S. gallon and the right tank 8.5 U.S. gallons. Fuel was added to the aircraft, and, on a test run, the engine developed normal power. The fuel quantity of the tanks was adjusted so there was one-half gallon in the left tank and 8.5 gallons in the right tank, and the aircraft was suspended. While the aircraft was suspended, the right wing was lowered until the fuel outlets were uncovered and the fuel flow stopped. The aircraft was three degrees right-wing-low when this occurred. The Cessna Owner's Manual suggests that "when the fuel selector or valve handle is in the BOTH position in cruise flight, unequal fuel flow from each tank may occur if the wings are not maintained exactly level." Both gauges were indicating about one-quarter of a tank; however, the right gauge frequently fluctuated between one-quarter and full, causing the pilot to mistrust the right gauge and to believe that there was fuel in the left tank. For this reason, he selected the left tank when the engine stopped.

Air Regulation 544 specifies that the amount of fuel carried aboard an aircraft shall be sufficient at the commencement of any VFR flight to fly to the place of intended landing and thereafter for 45 minutes at normal cruising speed.

The evidence suggests that the aircraft was flown right-wing-low for a sufficient duration to allow fuel to gravity-feed out of the higher left wing tank, through the fuel selector, and into the lower right wing tank. With the three-degree banked attitude and only 8.5 gallons of fuel in the right tank, the right tank fuel outlets became uncovered. Fuel from the left wing tank supplied the engine until the supply was exhausted, including two gallons of the 2.5 U.S. gallons of normally unusable fuel.

CONCLUSIONS:

Findings:

1. As a result of the aircraft being flown right-wing-low, the left tank drained into the right tank, causing the engine to stop when the left tank was empty.

2. Because the pilot mistrusted the fluctuating right fuel gauge, he selected the empty left tank when the engine stopped.

3. The manner in which the aircraft was refuelled resulted in an unknown fuel quantity.

4. The flight was conducted with inadequate fuel reserves.

Causes:

Although the pilot had the fuel selector on BOTH for the entire trip, the attitude in which the aircraft was flown caused fuel depletion of the left tank, and the engine stopped because of fuel starvation.

SAFETY ACTION:

Action Taken:

On 25 February 1988, Transport Canada issued Service Difficulty Advisory (SDA) AV-88-01 concerning fuel management on Cessna aircraft Model 180 series A, B, C, and D. Transport Canada strongly recommended that owners/operators (of pre-1962 Cessna 180 aircraft) placard the Fuel Selector Valve to instruct that the valve should be set at the BOTH ON position when the aircraft is operated in any attitude other than level flight. This SDA repeated information given in N-AME-AO No. 10/68 published 13 March 1968.

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PIPER PA-12 C-FNCM
CLOVA, QUÉBEC 60 mi NNW
27 SEPTEMBER 1987

REPORT NUMBER: 87-Q70044 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1215 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	135	46
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot of the float-equipped aircraft was making a number of trips at an altitude of 500 feet agl between

Lac Berthelot and an unnamed lake located about 30 miles to the northeast, in order to set up a hunting lodge. On reaching his destination, the pilot made a turn over the lake to assess the wind conditions. During the final approach, the pilot, realizing that he was too far ahead and too high above the lake, decided to repeat the manoeuvre by making a steep turn to the right. During the turn, the aircraft sank rapidly. The pilot actuated carburettor heat and moved the throttle rapidly several times; however, he was not able to increase the power in time to regain control. Since the aircraft was rapidly nearing the ground, the pilot pulled fully back on the control column to raise the aircraft's nose, thus cushioning the impact with the trees. The pilot was uninjured.

The weather at the time of the accident was suitable for the flight. The wind was calm, the temperature was 11 degrees Celsius, and the dew point was one degree Celsius.

Because the flight was short, there was no carburettor icing. The aircraft weight was close to the maximum allowable gross weight. The pilot had attached a 10-foot-long canoe to the right float supports.

Examination of the wreck showed that the control surfaces were operating correctly. The condition of the propeller indicated that the engine was producing very little power at the time of impact. Although it was not possible to run the engine at the accident site, it was established that there was fuel in the tanks, that the selectors were set to the open position, and that the filter bowl was not contaminated. There was nothing to indicate any pre-accident failure or malfunction of the aircraft or its systems.

The log book indicated that the aircraft had been certified and maintained in accordance with existing regulations and approved procedures.

Following the steep turn at reduced power, the aircraft speed fell below the stall speed, and the aircraft sank. The canoe attached to the right float supports increased drag in the turn and also increased the stall speed. Actuation of the carburettor heat resulted in a richer fuel mixture, and the rapid throttle movements flooded the engine and prevented acceleration.

Because of the low altitude, the pilot was unable to regain control of the aircraft.

CONCLUSIONS:

Findings:
1. The pilot performed a steep turn with reduced power at low altitude.

2. The drag caused by the canoe attached to the float supports increased the stall speed.

3. Actuation of the carburettor heat resulted in a richer fuel mixture, and the rapid throttle movements flooded the engine and prevented acceleration.

4. Because of the low altitude at which the turn was performed, the pilot was unable to regain control of the aircraft.

Causes:
The aircraft stalled when the pilot made a steep turn with reduced power at low altitude and with a canoe attached to the right float supports.

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CESSNA 180 SKYWAGON N64360
RIVIÈRE AUX OUTARDES, QUÉBEC
30 SEPTEMBER 1987

BRIEF NUMBER: 87-Q70903 (Accident)
LOCAL TIME: 1830 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,500	1,000
LAST 90 DAYS	100	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The float-equipped aircraft took off in a southeasterly direction from Rivière aux Outardes for Pletipi Lake, Québec, with two people on board. Because of the strong current on the river, the pilot took off in a direction that resulted in a 5- to 10-knot tail wind. After takeoff, at approximately 50 feet above ground level (agl) and at a speed of 70 knots, the pilot turned right to follow the river, and the aircraft encountered stronger winds. The aircraft drifted toward the left river bank, and, in an attempt to avoid a rock formation on the shore, the pilot banked the aircraft steeply to the right. Both floats contacted a ledge, the aircraft levelled off, and the left wing hit another ledge. The aircraft nosed over beside the river. The pilot and passenger escaped injury.

The river is surrounded by mountains and steep banks of rock formations, and, at the end of the straight portion used for the take-off, the river turns to the right.

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PIPER PA-18 SUPER CUB C-FDWK
LAC CANARD, QUÉBEC
04 OCTOBER 1987

REPORT NUMBER: 87-Q70047 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1200 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	262	91
LAST 90 DAYS	19	19

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	1	-

HISTORY OF THE FLIGHT:

The pilot of the float-equipped aircraft and his passenger took off toward rising terrain from a small narrow lake. At approximately 100 feet above the surface, a steep right turn was made, during which the pilot lost control of the aircraft. The aircraft completed one quarter of a rotation before striking the lake surface in a right-wing-low, steep nose-down attitude. The substantially damaged aircraft then sank, coming to rest in an inverted position. The pilot drowned and the passenger was seriously injured.

PERTINENT INFORMATION:

There were no mechanical problems reported prior to the accident. All flight controls were present, and the control cables were free and unbroken. The survivor, who was a pilot familiar with the Super Cub, reported that the engine functioned normally right up to the time of the loss of control. The aircraft was not equipped with a stall-warning system.

The sky was clear, and the visibility was reported in excess of 15 miles. The wind was moderate from the northwest, almost perpendicular to the length of the lake. The narrow lake is oriented east-northeast/west-southwest and has higher terrain on the north, east, and south sides. The western end of the lake opens into a wide lower valley. The take-off was made toward the east and was started from a point where approximately 3,000 feet of the lake's 4,500-foot length was available for the take-off run.

Take-off performance was reported as normal, and the pilot initiated his climb to altitude immediately after lift-off. The climb was maintained until the steep right turn was made.

ANALYSIS:

The decision to take off toward the higher terrain to the east and not to use the lake's entire length for take-off forced the pilot to start climbing immediately after take-off which resulted in a climb speed lower than normal. The steep turn increased the aircraft's stall speed. The combination of these two factors resulted in a greatly reduced margin between the aircraft's airspeed and stall speed. Additionally, the take-off was made in the calm air in the lee of some hills. Upon climbing, the aircraft left the calm air and flew into a quartering tail wind which, due to inertia, would have resulted in a decrease in the aircraft's airspeed. Additionally, the right turn made the quartering tail wind a full tail wind and further removed the aircraft from any moderating influence of the terrain, resulting in a greater reduction in airspeed.

The loss of aircraft control in the turn, the steep nose-down attitude, and the rotation of the aircraft all indicate that, in making the turn, the pilot allowed the airspeed to decrease, and the aircraft stalled and entered a spin. Due to the low altitude of the aircraft, the pilot was unable to effect a recovery.

CONCLUSIONS:

Findings:
1. The pilot attempted to take off toward rising terrain when an obstacle-free take-off run was available.

2. The pilot did not use all the take-off run available.

3. The pilot did not allow the aircraft to accelerate to its optimum climb speed before starting the climb.

4. The aircraft stalled and spun at too low an altitude to effect a recovery.

Causes:
The aircraft stalled in a steep turn shortly after take-off.

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CESSNA 172N C-GQHN
RONDEAU BAY, ONTARIO
11 OCTOBER 1987

BRIEF NUMBER: 87-O/70079 (Accident)
LOCAL TIME: 1400 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	641	170
LAST 90 DAYS	5	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The aircraft departed from Ericau, Ontario on a pleasure flight to Rondeau Bay on the north shore of Lake Erie. On arrival, the pilot carried out a flapless landing on glassy water and, just after touchdown, the aircraft's left float dug in. The aircraft pitched down, turned left, and the right wing struck the water. The aircraft then pivoted right, and the left wing struck the water. The force of both impacts shattered the windscreen and caused substantial damage to both wings and floats. The aircraft came to rest in an upright position.

THURSTON TEAL TSC-1A1 C-GREE
WHITE WATER LAKE, ONTARIO
11 OCTOBER 1987

BRIEF NUMBER: 87-O/70080 (Accident)
LOCAL TIME: 1530 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	15,000	34
LAST 90 DAYS	234	34

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot and passenger departed from a lake in an amphibious hull seaplane for a short local flight to inspect a grass landing strip. On preparation for landing, the pilot lowered the landing gear; however, he decided not to land on the strip and returned to the lake. The landing gear was not retracted for the landing on the water. When the aircraft touched down, it nosed over and sank.

LAKE LA4-250 RENEGADE N8403H
OROMOCTO LAKE, NEW BRUNSWICK 2 mi N
08 JANUARY 1988

BRIEF NUMBER: 88-A0009 (Accident)
LOCAL TIME: 1710 AST
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	652	18
LAST 90 DAYS	98	18

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was en route from Gander, Newfoundland to Bangor, Maine and had been airborne 5 hours and 50 minutes when the fuel pressure decreased and the engine (Lycoming IO-540) lost power. The pilot carried out a successful forced landing on a snow-covered field, touching down on the aircraft hull, with the landing gear retracted. The aircraft was not damaged.

The aircraft was equipped with a ferry fuel tank, in addition to the standard tanks. Because of a combination of fuel mismanagement and ice that blocked the vent to the ferry fuel tank, the fuel was depleted from the main tanks, and the engine stopped.

After removing the ice from the ferry fuel tank vent line, the pilot did a take-off on the aircraft hull with the landing gear retracted. During the take-off, the aircraft struck trees at the end of the field, resulting in damage to the left sponson and the leading edge of the left wing. The pilot continued the flight and landed without further incident at Bangor, Maine.

BELLANCA 8GCBC SCOUT C-GBAZ
FORT ALBANY, ONTARIO 14 mi S
03 February 1988

BRIEF NUMBER: 88-O/0041 (Accident)
LOCAL TIME: 1600 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,000	N/A
LAST 90 DAYS	16	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

During a take-off run from the snow-covered frozen surface of a river, the ski-equipped aircraft suddenly veered to the left and headed toward the river bank. The pilot closed the throttle and applied full right rudder, but the aircraft continued and struck trees on the river bank.

A bungee cord attached between the front check cables on the left and right skis could have caught on a snow hummock and caused the aircraft to veer to the left.

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U.S. FISH & WILDLIFE SERVICE
CESSNA A185F SKYWAGON N757
MOSSY RIVER, SASKATCHEWAN
02 AUGUST 1987

REPORT NUMBER: 87-C70908 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1730 CST
OPERATION: State
DAMAGE: Substantial
PILOT LICENCE: Commercial (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	20,000	4,000
LAST 90 DAYS	150	150

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot of the amphibious float-equipped aircraft departed the land airport at Cumberland House for a short visual flight rules (VFR) flight to Mossy River, Saskatchewan. The flight to Mossy River was uneventful, and the pilot flew a normal approach for a water landing at his destination. On touchdown, the aircraft nosed over.

After take-off, the pilot had not retracted the wheels, and, as he did not use a check-list, he did not confirm their position prior to touchdown on the water. The extended wheels caused the aircraft to nose over when they contacted the water.

CONCLUSIONS:

Findings:
1. The pilot of the amphibious float-equipped aircraft did not ensure that the wheels were retracted prior to attempting the water landing.

2. The extended wheels caused the aircraft to nose over on touchdown.

Causes:
Because the pilot did not use a check-list after take-off and before landing, the aircraft was landed on water with the wheels extended.

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RISK OF COLLISION BETWEEN:
BEECHCRAFT QUEEN AIR 65-B80 C-FCGS and
CESSNA 150 C-FXWG
KINGSTON AIRPORT, ONTARIO
06 JANUARY 1988

BRIEF NUMBER: 88-O/0005 (Incident)
LOCAL TIME: 1538 EDT
INFORMATION SOURCE: Field Investigation

BEECHCRAFT QUEEN AIR 65-B80 C-FCGS

OPERATOR: Government of Canada, Department of Transport Aircraft/Canadian Aviation Safety Board Crew
OPERATION: State-Federal
DAMAGE: Nil
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,670	125
LAST 90 DAYS	27	27

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

CESSNA 150 C-FXWG

OPERATION: Private Recreational
DAMAGE: Nil
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	130	80
LAST 90 DAYS	50	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The crew of the Beechcraft Queen Air was departing from Kingston Airport for a return visual flight rules (VFR) training flight to Ottawa, Ontario. Prior to departure, the crew reported that all required check-list items had been completed and that several position reports were transmitted to the flight service station (FSS) located on the airfield. The crew did not receive acknowledgements from the FSS personnel and assumed that the duty officer was busy and unable to make radio transmissions. The crew made an apparently uneventful take-off and departure from runway 01.

During the taxi, run-up, and departure of the Queen Air, the FSS duty officer was occupied with the preparation of a Notice to Airmen (NOTAM) as well as making radio acknowledgements to a Cessna 150 that was departing on runway 30. Neither the duty officer nor the Cessna 150 pilot received any transmissions from the Queen Air. They were not aware that the Queen Air was departing runway 01.

At 1538 EDT, the Cessna 150, having complied with mandatory frequency (MF) requirements, departed runway 30, and, at a position 50 to 100 feet above the runway, the pilot observed a red and white Queen Air pass directly forward of his flight path from left to right. The FSS specialists did not observe the No Radio (NORDO) Queen Air until it had lifted off from runway 01 as the Cessna 150 was in initial climb from runway 30. The specialist reported that the Cessna 150 passed directly behind the departing NORDO Queen Air at the same altitude. The FSS duty officer was unable to make radio contact with the Queen Air.

As the Queen Air was climbing through 3,500 feet, the crew noted that Kingston FSS still had not acknowledged the co-pilot's radio transmissions. The pilot attempted to transmit using his microphone control yoke button and noticed that No. 1 very high frequency (VHF) radio (tuned to MF 122.5 MHz, Kingston) was selected to the OFF position. The radio was selected on, and the crew established normal two-way communications with Kingston FSS. At that time, the near-miss incident was reported to the Queen Air crew.

The airport weather observation at the time of the incident reported ground visibility of +15 miles with high scattered clouds. An item on the "After Starting and Taxi" check-list that was on board the Queen Air read "Avionics-ON and CHECKED."

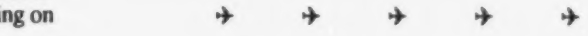
Had the crew of the Queen Air followed the check-list, the radio (avionic) equipment would have been operational and the transmissions made prior to take-off would have been received by the FSS specialist and the pilot of the Cessna 150. Normal radio communications as required by regulations would have permitted coordination of air and ground traffic movements at the uncontrolled airport.

CONCLUSIONS:

Findings:
1. The flight crew of the Queen Air did not follow required check-list procedures.

2. Weather conditions at the time were not a factor.

Causes:
The flight crew of the Queen Air did not make the mandatory radio transmissions prior to departure from the uncontrolled airport because of inadequate cockpit procedures. The flight crew did not follow the check-list.



ALPINE HELICOPTERS LTD.
BELL 204B (Helicopter) C-FOKY
VALEMOUNT, BRITISH COLUMBIA 15 mi W
29 JULY 1987

REPORT NUMBER: 87-P70056 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0902 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,900	350
LAST 90 DAYS	110	60

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	10

SUMMARY REPORT:

The helicopter was engaged in transporting groups of hikers from the Caribou Mountain Lodge to various vantage points on the nearby mountains. On this flight, the pilot was transporting a group, consisting of a guide and nine passengers, from the lodge to a sightseeing point called Sidekick, at 7,700 feet above sea level (asl). The helicopter was approaching the landing site, and, as the pilot applied power to arrest the descent, loud noises were heard from the engine, and a substantial loss of power was experienced. The pilot made a 180-degree turn and carried out an autorotational landing into the only available relatively level area. The helicopter landed heavily on the rough surface and was substantially damaged; the occupants were not injured in the landing, but one passenger hurt her back when she fell while disembarking from the helicopter.

At the time of the accident, the sky was clear with unlimited visibility, the temperature was 12 degrees Celsius, and the wind was from the southwest at 10 to 15 knots.

Witnesses among the people who had landed at the site earlier also heard unusual noises from the helicopter's engine, and one witness reported seeing flames coming out of the engine exhaust.

The engine was removed from the helicopter and sent to Standard Aero in Winnipeg. When an attempt to run the engine in a test cell was made, the compressor stalled, unusual noises were heard, and flames came out of the exhaust, as described by witnesses to the accident. It was found that the compressor bleed band, which opens to relieve airflow during acceleration, was not opening because a diaphragm (part number 1-300-582-01) in the bleed band actuator had ruptured. The diaphragm had deteriorated, and rubber was delaminating from the fabric.

There is no specified overhaul time for the bleed band actuator as it is an "on condition" item. No accurate records of the early history of the engine, when it was installed in an aircraft in the United States, were available; however, this diaphragm, which is an improved type required by Service Bulletin 0030, is known to have been installed between June 1975 and May 1980, making it at least seven years old. Since May 1980, the engine had logged 1,389 hours.

The diaphragm in the bleed band actuator ruptured, causing the compressor to stall as the engine began to accelerate when the pilot applied power to arrest the helicopter's descent on approach. When the engine did not respond, the pilot was forced to make an autorotational landing onto unsuitable terrain.

CONCLUSIONS:

Findings:

1. The diaphragm in the bleed band actuator deteriorated and ruptured, causing the bleed band to malfunction.

2. The helicopter's engine lost power on approach to landing.

3. There is no specified overhaul time for the bleed air actuator.

Causes:

The helicopter's engine lost power because of a ruptured diaphragm in the bleed band actuator.

CAN-ARC HELICOPTERS LIMITED
BELL 206B JETRANGER (Helicopter) C-GHTN
SMITH, ALBERTA 12 mi NE
30 JULY 1987

REPORT NUMBER: 87-W70051 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1230 MDT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Destroyed
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,075	650
LAST 90 DAYS	175	125

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot, flying the helicopter on a forestry contract, was dropping water from a water bucket onto a small forest fire. On the second trip, the pilot slowed down to near the hover, about 100 feet above the trees. Forestry ground personnel requested him to move to the right to get over the fire before he dropped the load. As the pilot made the correction, the helicopter started rotating to the right and eventually struck the trees. After the impact, the pilot escaped through the right rear door; the helicopter burst into flames and was destroyed by fire.

Examination of the burnt wreckage did not show any mechanical problems. The capacity of the bucket had been reduced to 70 gallons, which resulted in a calculated gross weight of 3,165 pounds, which is the maximum all-up weight at which the helicopter could hover out of ground effect under the conditions existing at the time. A torque of 98 per cent had been required to lift the bucket out of the river, which was 300 feet below the altitude of the fire. While the helicopter was approaching the fire, its airspeed was below 10 knots and decreasing. The pilot reported that he heard the low-rotor-warning horn shortly after losing control.

When questioned after the accident, the pilot was unable to recall what control inputs he had made while looking outside the helicopter and positioning the bucket over the fire. Although the pilot reported that he had dumped the water from the bucket before the helicopter started spinning, witnesses on the ground observed water splashing out of the bucket during the rotating descent. The bucket was destroyed by the post-crash fire, and it could not be determined whether the water had been dumped before the impact.

On the day before the occurrence, under similar conditions, the pilot had lost control of the helicopter, which then spun to the right a number of turns before the pilot regained control. After the accident, the pilot was unable to describe the proper technique required to recover from loss of tail-rotor effectiveness.

While hovering out of ground effect, an unanticipated right yaw or loss of tail-rotor effectiveness can occur. A 1 per cent decay in main rotor rpm will result in a 3 per cent decay in tail-rotor rpm. When main-rotor rpm decays because the pilot pulls more pitch, this rpm decay is amplified proportionately for the tail rotor until tail-rotor effectiveness is lost.

In this case, while the helicopter was at low forward airspeed and at low altitude, the pilot's attention was diverted during a critical manoeuvre, and he inadvertently allowed the helicopter to start rotating to the right. The pilot did not then take the appropriate corrective action, and, as the speed of the rotation increased, he increased the collective pitch, causing the main rotor rpm to decay and tail-rotor effectiveness to be lost.

CONCLUSIONS:

Findings:
1. The helicopter was being hovered out of ground effect at the maximum weight possible under the existing conditions.

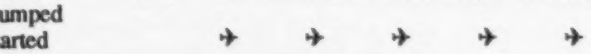
2. The pilot's attention was diverted during a critical manoeuvre, and he inadvertently allowed the helicopter to start rotating to the right.

3. The pilot did not understand or use the proper technique to recover from loss of tail-rotor effectiveness.

4. The pilot increased the collective pitch, causing the main rotor rpm to decay and tail-rotor effectiveness to be lost.

5. The pilot lost control of the helicopter which then crashed.

Causes:
When the helicopter began to rotate to the right, the pilot did not use the correct recovery technique; as a result, control was lost, and the helicopter crashed.



OKANAGAN HELICOPTERS LTD.
HUGHES 369D (Helicopter) C-GVXT
TASAYTA LAKE, BRITISH COLUMBIA 30 mi E
30 JULY 1987

REPORT NUMBER: 87-P70060 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1250 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,700	1,200
LAST 90 DAYS	130	120

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot had made approximately 14 trips, long-lining drill equipment to a road. Following the last trip, the pilot landed to remove the long line and to hook up three short lanyards in series to load the equipment on a truck. After loading the truck, the pilot landed once again to refuel and then took off, with the three lanyards still attached, to return to the campsite. While in cruise, at an altitude of 300 feet above the tree-covered terrain, the pilot heard a buzzing sound coming from the rear of the helicopter, and the helicopter immediately started to yaw and lose altitude. The pilot lowered the collective and decreased power, slowing down the rotating helicopter; however, it continued out of control and spun down into the trees. The pilot raised the collective fully just prior to striking the trees, and the helicopter descended almost vertically into the trees, coming to rest on its left side.

The elevation at the roadway was 3,600 feet above sea level (asl), and the drill campsite was at an altitude of approximately 5,000 feet asl. The terrain in this area is hilly and covered with trees which are 70 to 100 feet high. The weather at the time was clear with the wind from 030 degrees magnetic at 10 knots.

The helicopter took off from the road with the three short, flat-type lanyards attached in series to the cargo hook; their total length was 14 feet 3 inches when not under load. The three lanyards were still attached to the helicopter at the occurrence site and evidence of a tail-rotor tip strike was found on the hook of the last lanyard. The complete tail rotor and tail-rotor gearbox assembly were recovered 452 feet from the main wreckage site, along the flight path. No evidence could be found indicating that the tail-rotor assembly failed from a mechanical or material flaw. When the three lanyards were installed on an identical Hughes helicopter, they extended back far enough to make contact with the rotating tail-rotor blades.

The evidence indicated that the helicopter's cruise speed of 80 mph combined with the gusty wind conditions caused the end of the flat-type lanyards to fly up into the tail-rotor blades and caused the loss of the tail rotor.

CONCLUSIONS:

Findings:
1. The end of the lanyards attached to the cargo hook flew up and struck the tail-rotor blades during flight.

2. The tail rotor and tail-rotor gearbox separated from the helicopter as a result of the lanyard strike.

3. The pilot was unable to control the helicopter following the loss of the tail rotor, and the helicopter crashed.

Causes:
The helicopter's cruise speed of 80 mph combined with the gusty wind conditions caused the end of the flat-type lanyards to fly into the tail rotor blades.

TUNDRA HELICOPTERS LTD.
HUGH 369D (Helicopter) C-GXJR
POWELL LAKE, BRITISH COLUMBIA 20 mi SE
07 AUGUST 1987

REPORT NUMBER: 87-P70068 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2030 PDT
OPERATION: Commercial Non-Revenue
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,100	950
LAST 90 DAYS	270	270

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

While the aircraft was in flight at 300 to 500 feet above ground level (agl), the engine torque gauge began to fluctuate. Within 15 seconds, the engine gas producer and the main rotor rpm gauges began to fluctuate. The

engine then stopped, and the pilot carried out an autorotation to a rocky sand-bar. Just before ground contact, the helicopter started to turn to the left; the helicopter landed hard, and, on impact, the right skid failed in overload and two of the five main rotor blades struck the ground. The pilot and two passengers were not injured.

Earlier in the day, while the helicopter was on the ground, the engine had decelerated on its own and had been shut down by the pilot who investigated unsuccessfully for the cause. He then flew a short flight, and, after landing, the engine again decelerated for no apparent reason. The pilot again could not determine the cause and flew two more short flights without recurrence of the problem. He then discussed the problem by phone with a company engineer; they decided that the helicopter would operate normally at flight power, so the pilot took off on the accident flight. Before the flight, the pilot had verifeid that there was no contamination in the helicopter fuel system or the fuel source.

Examination of the helicopter and engine at the scene of the accident did not reveal any problems which would have contributed to the engine failure. The engine was then removed and run on a test stand at an engine overhaul and repair facility, and its performance exceeded the manufacturer's minimum specifications. The reason for the loss of engine power could not be determined.

CONCLUSIONS:

Findings:

1. The engine failed in flight for undetermined reasons.

2. The ensuing autorotational descent resulted in a hard landing.

3. The pilot attempted flight with an unresolved engine problem.

Causes:

The pilot took off with an unresolved engine problem, and the engine failed in flight for undetermined reasons; following the autorotation, the helicopter landed hard.

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CCI AVIATION LTD.
BELL 206B JETRANGER (Helicopter) C-GJMM
MCBRIDE, BRITISH COLUMBIA, 30 mi NW
31 AUGUST 1987

REPORT NUMBER: 87-P70075
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1400 PDT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Destroyed
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,840	N/A
LAST 90 DAYS	140	90

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

On 31 August 1987, the helicopter was being used to start slash fires on a mountainside near Diggins Creek, British Columbia. One drum of the flaming fuel-gel mixture had been drizzled onto the slash from the drip-torch unit slung below the helicopter, and a second drum was being applied when the helicopter pilot radioed that he was having a problem. The helicopter was then seen to descend to the mountainside, crash, and then explode.

A nearby helicopter was called to the accident scene. As it circled overhead, the pilot reported that the accident helicopter was completely destroyed and that there was no sign of the pilot. The pilot was subsequently found, severely burned, about 100 yards from the crash site and was flown to hospital where he died of his injuries the next day.

PERTINENT INFORMATION:

At the time of the accident, mid-level broken clouds were present. The wind was light, and there were no restrictions to visibility. The temperature was 20 degrees Celsius.

The pilot was licensed and medically fit. He had 19 hours of drip-torching experience, all flown the week before the accident. The pilot was wearing a flying helmet, boots, jeans, and a T-shirt at the time of the accident.

The helicopter's maintenance log book contained no evidence of uncorrected deficiencies, and the helicopter's weight and centre of gravity were within the prescribed limits at the time of the accident. The engine-out warning horn was disabled, as allowed by regulation. Fuel in

the company storage tanks from which the helicopter had been refuelled was tested; it was the correct grade and was not contaminated.

The drip-torch unit, slung from the helicopter's cargo hook, was attached in such a manner that the pilot could jettison it in an emergency. The flaming fuel-gel mixture was being drizzled onto the slash from the torch nozzle, and the ignition and discharge of the mixture were controlled by the pilot with a thumb-operated toggle switch on the helicopter's collective control. When the switch was pressed, the torch's fuel supply and the ignition mechanism at the torch nozzle were activated instantly, and, when the switch was released, the torch's fuel supply and ignition were cut off. The drip-torch unit was found in the wreckage disconnected from the helicopter's cargo hook. The helicopter cargo hook and the drip-torch connector ring were 18 inches apart.

The helicopter was working close to the ground when the engine lost power. It landed heavily on a tree stump and fell over onto its side; the force of the impact ruptured the helicopter's fuel tank. Fuel splashed throughout the wreckage and on the pilot. The pilot later told his rescuers that he had difficulty undoing his seat-belt because of his position in the seat and that the wreckage exploded moments after he stepped clear of the cockpit. The pilot's clothing caught fire, and he was severely burned.

The engine was removed from the wreckage for examination. The condition of the engine compressor section indicated that it had been rotating slowly when the helicopter crashed. A number of stator and rotor blades from the compressor were damaged and/or missing. The Canadian Aviation Safety Board Engineering Laboratory report concluded that the engine failure was caused by the separation of two third-stage compressor rotor blades, failure most likely due to material weakness resulting from corrosion.

The emergency locator transmitter was destroyed in the fire and did not function.

It is conceivable that, had a crashworthy fuel system been incorporated in the helicopter, the fuel spill from the helicopter fuel tank might have been contained and the severity of the accident thus reduced.

ANALYSIS:

When the helicopter's engine lost power, the pilot inadvertently made a heavy landing on the tree stump. The pilot probably did not have time to jettison the drip-torch unit. The spilt fuel from the ruptured fuel tank was probably ignited by the drip-torch ignition system, causing the explosion. The pilot was unable to escape quickly enough; he suffered fatal burns when his clothing ignited.

CONCLUSIONS:

Findings:

1. The engine lost power when two compressor blades failed.

2. The pilot made a forced landing.

3. The helicopter crashed beside the drip-torch unit.

4. The helicopter's fuel tank ruptured as a result of the heavy landing on a tree stump.

5. The helicopter's spilt fuel was ignited, causing an explosion.

6. The pilot was not wearing adequate clothing to provide him with a reasonable degree of fire protection, and he received fatal burn injuries.

7. The ELT was destroyed by the fire and did not function.

8. Corrosion was found present in the compressor.

Causes:

Failure of two compressor blades resulted in engine failure. Evidence indicates that the blades failed due to material weakness resulting from corrosion.

SAFETY ACTION:

Action Taken:

In its 7/88 issue of Aviation Safety Vortex, Transport Canada used the events of this occurrence to highlight the consequences of not wearing fire-resistant flight clothing in high risk operations.

YUKON HELICOPTERS LTD.
HILLER UH12E C-FYSM
MAFEKING, MANITOBA 5 mi NW
01 SEPTEMBER 1987

REPORT NUMBER: 87-C70072
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0640 CDT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Destroyed
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,173	180
LAST 90 DAYS	70	70

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	1	-	-

HISTORY OF THE FLIGHT:

The pilot and passenger, a chemical loader, departed Mafeking, Manitoba, for a flight to a aerial spray loading site 10 miles away. When the helicopter failed to arrive at the site, a search was initiated. The helicopter was subsequently found five miles along, and one-half mile to the left of, the intended track. Both occupants died in the crash, and the helicopter was destroyed by fire.

PERTINENT INFORMATION:

The flight path ran northwest over rising, hilly terrain, covered by 40-foot-high trees and dense bush. A bush road ran across the intended flight path approximately 100 yards south of the crash site. The helicopter descended into the trees in a 30-degree right bank, 45-degree nose-down attitude, heading approximately 90 degrees to the intended direction of flight, and came to rest in an inverted position.

The engine was extensively damaged in the post-crash fire. Five of the six pistons had melted in their cylinders. The accessory case, carburettors, and carburettor heating system were completely destroyed. The controls were checked for integrity, to the degree possible, and no evidence of pre-impact failure was found. The source of fuel for the aircraft was checked and was found free of contaminants.

The transmission and main rotor separated at the freewheeling unit on impact and received very little damage. As the transmission separated from the unit, the input sun gear scored the inside of the bevel gear in a manner which clearly indicated that the engine was not rotating at impact.

Weather conditions varied throughout the area. The weather reported by observers at Mafeking and the loading site was good. Other observers in the accident site area reported overcast skies and periodic misty conditions. An aftercast estimated that the weather could have been as low as a broken to overcast ceiling of 800 feet, with visibility as low as one-half mile in drizzle and fog. Twenty minutes after the accident, the closest reporting station, located 60 miles northwest of the accident site, reported a 2,500-foot broken ceiling, 15 miles visibility, with temperature and dew point readings of nine degrees Celsius. The temperature and dew point spread throughout the area was very small, giving conditions very conducive to carburettor icing.

The helicopter's weight and centre of gravity were determined to be within the prescribed limits at the time of the accident. The helicopter was certified, equipped, and maintained in accordance with existing regulations and approved procedures. It was equipped with a spray system, and this installation resulted in a restriction to the Certificate of Airworthiness limiting the operation of the helicopter to essential flight crew only, with no passengers to be carried.

The pilot was qualified for the flight and was well rested. The autopsy and toxicological examination did not reveal any evidence of pilot incapacitation.

ANALYSIS:

The attitude of the helicopter at impact indicated that it was out of control. The engine was not producing power as evidenced by the sun gear score marks on the bevel gear. The reason for the loss of power could not be determined; however, as conditions were conducive to carburettor icing, it is possible that this was the cause of the loss of power.

The bush road near the crash site offered the only possible safe landing place in the immediate area. It is possible that the pilot was attempting to conduct an autorotation to the road following the loss of engine power, but had insufficient altitude or forward speed to successfully complete this manoeuvre.

The chemical loader was being transported to the loading site in contravention of the restricted airworthiness certificate.

CONCLUSIONS:

Findings:
1. The engine lost power.

2. The atmospheric conditions were conducive to carburettor icing.

3. The helicopter was out of control at the time of impact.

4. The passenger was being transported in contravention of the restricted Certificate of Airworthiness.

Causes:
The engine lost power, and the pilot was unable to conduct a successful autorotation in hilly, treed terrain.

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VANCOUVER ISLAND HELICOPTERS
BELL 206B JETRANGER (Helicopter) C-GMGN
CAMPBELL RIVER, BRITISH COLUMBIA 30 mi N
04 SEPTEMBER 1987

REPORT NUMBER: 87-P70077 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2000 PDT
OPERATION: Commercial Non-Revenue
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,500	1,800
LAST 90 DAYS	164	164

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	4

SUMMARY REPORT:

The pilot and four passengers, who were senior company employees, departed Quatam River, British Columbia in the helicopter for Campbell River. About four minutes after the take-off while the helicopter was in normal cruise at 2,000 feet above sea level (asl), the engine-out audio warning horn sounded. The pilot made an autorotational landing in the ocean. All aboard escaped uninjured, and the helicopter was recovered from the water before it sank.

When the engine-out warning system activated, the pilot immediately lowered the collective and initiated an autorotation. The pilot was asked by one of the passengers to radio a MAYDAY, which he did. Another passenger, with 10,000 hours flying experience, asked the pilot if he was sure that the engine had failed. The pilot pulled up on the collective and, noting that the rotor rpm started to decay, lowered the collective again, without cross-checking the engine instruments. The pilot attempted an in-flight relight, but he noted that, when the starter was activated, the N1 tachometer remained at zero per cent. The passengers donned life-jackets, and the pilot made a gentle autorotational landing in the water.

When the helicopter had undergone a 100-hour inspection two days previously, the N1 tachometer generator was replaced. This generator provides the electrical signal for the N1 gas generator rpm gauge as well as for the engine-out audio warning horn and light. Inspection of the helicopter and engine after the accident found no cause for the engine to have failed, but the cannon plug to the N1 tachometer generator was found disconnected and undamaged.

Bell Helicopter Technical Bulletin Number 206-82-71 states that "failure of the engine N1 rpm tachometer generator causes the engine-out audio warning horn to signal an erroneous engine failure, which has occasionally confused the pilot, causing an improper control response. In several recent cases, the N1 tach generator failed and the engine-out warning horn activated. The pilot, hearing the horn sound, surmised he had an engine failure and elected to go with emergency landing procedures. The aircraft autorotated into undesirable terrain."

It is probable that, when the N1 tachometer generator was changed, the connecting cannon plug was not tightened sufficiently, and it became disconnected in flight; when this happened, the N1 rpm reading decreased, thus activating the engine-out warning horn. The pilot, who was distracted by the comments and suggestions being made by the passengers, did not confirm the suspected engine failure and elected to continue the autorotation after he saw no N1 indication during his attempted in-flight start. When the pilot pulled up the collective, it is likely that the rotor rpm started to decay because he had closed the throttle to flight idle, as required in the airstart procedure. Following activation of the engine failure warning system, the pilot did not check the engine gauges to verify that the engine had actually failed.

CONCLUSIONS:

Findings:
1. The cannon plug of the N1 tachometer generator was not properly secured.

2. The cannon plug became disconnected in flight and caused the N1 rpm gauge to reduce to zero per cent and activate the engine-out warning system.

3. The pilot elected to autorotate into the water without verifying that the engine had actually failed.

4. Comments from passengers may have distracted the pilot, making it more difficult for him to analyze the failure.

Causes:
The improperly secured cannon plug of the N1 tachometer generator became disconnected. The pilot did not confirm that the engine had actually failed.

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OKANAGAN HELICOPTERS LTD.
HUGHES 369D (Helicopter) C-GCIT
TOODOGGONE RIVER, BRITISH COLUMBIA
07 SEPTEMBER 1987

REPORT NUMBER: 87-P70078 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2010 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6,300	25
LAST 90 DAYS	250	25

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	1	1

SUMMARY REPORT:

The helicopter was being flown in support of a mineral exploration program in northern British Columbia. The pilot, with his mechanic as a passenger, flew to Chenny Camp to pick up a driller who had been getting a broken piece of equipment welded. The driller said that he needed to take some drill- casing pipe with him; the pilot had not anticipated this request and only had a cargo net with him for external loads. The drill-casing pipe, in three-and five-foot lengths and weighing 240 pounds, was put in the cargo net and slung under the helicopter. The pilot, with the mechanic and the driller on board and the sling load below, took off to fly to Metsantan Camp, a distance of about 20 miles. The flight was made at about 75 mph and 1,200 feet above ground level.

About half-way to destination, turbulence was encountered, and the helicopter suddenly yawed violently to the right and began spinning. The pilot dove the helicopter to increase airspeed and was able to regain control and make an autorotational descent into the trees. The driller received back injuries during the landing.

There were scattered clouds, the visibility was good, and the temperature was 15 degrees Celsius. The wind was 15 knots from 250 degrees magnetic, and there was some turbulence in the lee of the hills.

The helicopter tail rotor blades were found on the ground about 400 feet from the accident site. Further back along the flight path, a five-foot piece of drill-casing pipe was found. One end of this pipe, which has a large square-cut screw thread on it, was deformed. Wedged in the thread were small pieces of aluminium and zinc chromate paint, matching that of the tail rotor blades. Part of the damaged blades conformed to the shape of the circumference of the pipe, and a matching imprint of the square-cut thread could be seen on a blade.

The driller, who had helped load the pipe in the cargo net, said that the net was undamaged when the pipe was loaded and that a check was made to confirm that the pipe could not pass through the net mesh.

The distance from the cargo hook to the tail rotor blade disc was 189 inches. The cargo net with the pipe in it was 200 inches in length and, therefore, long enough to reach the tail rotor. The speed selected for the slinging operation did not provide an adequate margin for the potential instability that could result from a turbulence encounter. When the helicopter encountered the turbulence, the cargo net swung to the rear and struck the tail rotor. The impact of the blades striking the pipe sheared the fork bolt attaching the blades, allowing them to tear free of the change links and fall free.

CONCLUSIONS:

Findings:
1. The cargo net struck the tail rotor when the helicopter encountered turbulence.

2. A piece of drill-casing pipe in the cargo net contacted the tail rotor blades.

3. The impact of the blades striking the pipe sheared the fork bolt attaching the blades, allowing them to tear free of the pitch change links and fall free.

Causes:
The pilot elected to attempt a slinging operation at too high an airspeed and with equipment which was unsuited to the task.

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ALPINE HELICOPTERS LTD.
BELL 47T C-FNOG
MEDICINE HAT, ALBERTA 12 mi NE
16 SEPTEMBER 1987

REPORT NUMBER: 87-W70062 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1330 MDT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	7,000	4,800
LAST 90 DAYS	200	110

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The helicopter had been airborne for one hour, engaged in a low-level (25 feet above the ground) spraying operation on the river's floodways, when the pilot noticed that the spray tank warning lights were indicating empty. The pilot switched off the spray system and began an en route climb during which the helicopter struck a single-strand power line. The pilot lost control of the helicopter which then struck the ground heavily and was substantially damaged.

The pilot had flown over the power line approximately one hour before the accident, but at a much higher altitude, and he had not seen the power line. The single strand 14,000-volt steel wire was suspended on the west side of the river by a 35-foot high wooden power pole approximately 70 feet from the river's edge. The east end of the 1,200-foot-long line was suspended from a 45-foot-high wooden power pole which was concealed by a stand of tall trees and was not readily visible. Because of the uneven nature of the local terrain, the west end of the power line was considerably higher than the east end. The power line had originally been marked with two orange marker balls; the ball on the west end of the line was partly missing, and that which was still attached to the line showed signs of extreme distress from weathering, suggesting that the ball may have fallen off the line some time before the accident. The ball on the east side of the line had slid down the line and was concealed in the same stand of trees that was concealing the east pole. The original aluminum power line that had been installed had been replaced with a one-quarter-inch steel guy wire to give its 1,200-foot span the necessary strength to withstand the winds, ice, and other loads such as the marker balls. The line had a minimum breaking strength of 6,500 pounds. Prior to the start of the investigation, the line was repaired by the local power authorities.

The day following the accident, the investigators flew in a helicopter along the route flown by the accident pilot under nearly identical lighting conditions, in an attempt to determine if the poles on the west and east sides of the river would have been visible to the pilot. It was noted that, under a certain altitude, the west pole was visible. The east pole was visible only when the viewer was exactly aligned with the power line. The power line was almost impossible to see except when the viewer looked at the marker ball and then attempted to follow the line to each pole. The single day-glo orange marker ball was easily spotted when the viewer flew low, and it was silhouetted against the sky. When the viewer was at a higher altitude, where the ball was silhouetted against the river bank, it was difficult to see the ball.

The owner of the land that was being serviced by the power line had expressed concern to the power authorities regarding the poor marking of the line and reported that the power company had not taken any action.

Because of the high risks of wire strike and other low-level accidents, the helicopter was equipped with crash-resistant break-away fuel and vent lines. The helicopter's flush fitting fuel tank caps had been modified by the installation of a three-sixteenth-inch bolt on the cap locking tab. This bolt projected out from the cap about one inch and was installed to allow for easier removal of the caps during refuelling. When the helicopter struck the wire, the wire struck the one-inch bolt on the locking tab of one of the fuel caps and opened it. The impact with the ground then dislodged the fuel tank. The crash-resistant break-away fuel and vent lines automatically sealed; however, as the fuel cap was off, the dislodged tank emptied its contents of jet fuel directly onto the pilot. The pilot was wearing sun glasses and an aviation-type safety helmet.

The pilot received chest injuries when his body struck the cyclic control; he was not wearing a shoulder harness as this had been removed because the inertia reel was unserviceable.

The pilot did not see the inadequately marked power line in time to avoid the collision with it. The crash-resistant fuel line separated normally, resulting in no fuel leakage; however, the fuel tank filler caps had been modified in a manner which allowed the normally flush fitting caps to be exposed to and strike the power line, resulting in fuel spilling onto the pilot. The pilot received chest injuries because he was not wearing a shoulder harness.

CONCLUSIONS:

Findings:
1. The power line was inadequately marked.

2. The east power pole and marker ball were concealed in a stand of trees.

3. The pilot did not see the power line, resulting in the helicopter hitting the wire and crashing.

4. The pilot's shoulder harness inertia reel was unserviceable and the shoulder harness had been removed, resulting in injury to the pilot's chest.

5. The helicopter's fuel tank caps had been modified in a manner which allowed the normally flush fitting caps to be exposed to and strike the power line, resulting in fuel spilling onto the pilot.

Causes:
The pilot did not see the inadequately marked power line in time to prevent a collision with it.

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RANGER HELICOPTER
AEROSPATIALE AS350B C-GNSM
QUESNEL, BRITISH COLUMBIA 3 mi SE
26 SEPTEMBER 1987

REPORT NUMBER: 87-P70082 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0837 PDT
OPERATION: Specialty Aerial Photography and Survey
DAMAGE: Destroyed
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	7,000	2,000
LAST 90 DAYS	35	35

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	1	-

SUMMARY REPORT:

The helicopter lifted off in conditions of reduced visibility in ground fog. During the climb-out, the pilot lost visual contact with the ground, and the helicopter collided with a residential power line, struck several trees, and descended into the backyard of a residence. The two seriously injured occupants were rescued by the property owner, and the helicopter was destroyed in the post-crash fire.

The accident site was about three miles to the southeast of Quesnel Airport, British Columbia. The helicopter had initially departed on a heading of 320 degrees magnetic and then turned right to a heading of about 015 degrees magnetic, while flying at an altitude of about 30 feet above ground level. Following the turn, the helicopter's lower vertical stablizer struck the 30-foot-high power line, and the main rotor and right skid then struck trees. The helicopter descended to the ground tail first and came to rest standing on the rear ends of its skid gear.

The weather at the airport was reported as a partially obscured sky with one-eighth-mile visibility in fog. The weather at the accident site, as observed by a witness, was partially obscured with one-eighth to one-quarter of a mile visibility in fog, calm wind, and some blue sky visible through occasional breaks in the fog.

The helicopter was serviceable, its weight and balance were within the prescribed limits, and no pre-occurrence failures or malfunctions were reported. The helicopter was not equipped for instrument flight although it had a functioning artificial horizon. Warm bleed air from the engine was used to defog the windshield, but there was no cockpit fan to expedite the process of defogging.

The pilot was familiar with the flying characteristics of the helicopter; he was, however, not qualified to fly under instrument flight rules (IFR). During the pre-flight preparations, he had observed another helicopter arrive through a break in the fog and make a successful landing across the street. The pilot stated that extensive fog and reduced visibility existed at the time of his take-off and that he attempted to climb out through a break in the fog. He further stated that he flared the helicopter the moment he felt that contact with an obstacle had occurred.

Perhaps motivated by the successful arrival of the other helicopter and the fact that some blue sky was visible through breaks in the fog, the pilot took off in marginal weather conditions. In doing so, he flew into conditions of extremely limited visibility and did not see the wire. Although the wire strike on the lower vertical fin indicates that the helicopter was flying in a nose-up attitude, it could not be determined why the pilot had not climbed following lift-off.

CONCLUSIONS:

Findings:
1. Extensive fog and reduced visibility existed at the time of the occurrence.

2. The pilot was not certified for flight in IFR conditions.

3. Apart from an artificial horizon, the helicopter was not equipped for flight in IFR conditions.

4. Warm engine bleed air caused the inside of the cooler windshield to fog over.

5. The helicopter was not equipped with a cockpit fan.

6. The pilot flew into conditions of extremely limited visibility.

7. The helicopter struck a power line and trees.

8. The helicopter was destroyed by a post-crash fire.

Causes:
The pilot attempted VFR flight into unsuitable weather conditions.

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TOTEM AIR LIMITED
BELL 47G-2 (Helicopter) C-FKPC
PARRY SOUND, ONTARIO 6.5 mi NE
05 OCTOBER 1987

REPORT NUMBER: 87-O/70076 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1023 EDT (approximately)
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	347	127
LAST 90 DAYS	55	55

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	1	-	-

HISTORY OF THE FLIGHT:

The pilot and passenger departed in the helicopter from Emsdale, Ontario, at 0932 eastern daylight time (EDT) for a flight to Parry Sound, Ontario, in visual meteorological conditions. The helicopter had been chartered to photograph pickerel spawning beds, and the passenger in the right seat was to photograph several spawning sites en route. The helicopter was seen flying westbound at low altitude near the Sequin River at about 1000 EDT. It appeared to be operating normally. At approximately 1023 EDT, the main rotor blades struck a hemlock tree about 60 to 70 feet above ground level (agl), and the helicopter crashed in a densely treed area. The accident occurred near a spawning bed which was in a large, steep river valley, oriented in an east-west direction. The wind was from the south to southwest at about 10 knots. Both occupants of the helicopter were fatally injured in the crash.

PERTINENT INFORMATION:

The pilot had been hired on a temporary basis for the flight. He had not flown on any previous aerial photography flights for the company and, prior to the flight, had not received the minimum company flight training in accordance with the company operations manual. No flight plan, flight notification, or flight itinerary was filed for the flight. The company chief pilot was at Emsdale before the pilot departed, and he knew the helicopter had about two hours of fuel on board, but he was not aware of the exact route for the flight nor the estimated time of arrival (ETA) at Parry Sound. Although the pilot's training and flight preparation did not comply with the procedures in the company operations manual nor with Air Navigation Orders (ANO) Series V, No. 4 and Series VII, No. 6, the chief pilot, who had hired the pilot, authorized him for the flight and observed the helicopter depart.

At about 1830 EDT, the chief pilot made several telephone inquiries to determine the location of the helicopter and crew. The Rescue Coordination Centre (RCC) in Trenton, Ontario was notified at about 2207 EDT when the chief pilot was unable to locate the whereabouts of the helicopter or crew. A communications search was conducted that night, and a full-scale aerial search was commenced the following morning. Although the accident location was overflown several times, the helicopter was not seen, and no emergency locator transmitter (ELT) signal was detected. On 08 October 1987, a local resident discovered the crashed helicopter at about 0830 EDT and notified the local authorities.

The wreckage of the helicopter was found about 30 feet northwest of the hemlock tree. The top of the hemlock tree was broken off, and several sections of the trunk were found near the base of the tree with fragments of the rotor blades embedded in them. Wood splinters from the main rotor blades were distributed outwards from the base of the tree. The red main rotor blade tip was found at the base of the hemlock tree; the white main rotor blade tip was about 90 feet to the southeast. Inspection of the helicopter revealed no evidence of mechanical or structural pre-impact failure.

The Pointer Sentry model C-4000 ELT had been annually inspected and returned to service on 23 February 1987. The ELT battery was due to be replaced in January 1988. The ELT had come free from its mounting bracket and was found lying face down on the ground. The side of the ELT casing had been pushed in and frac-

tured near the battery compartment. The ELT's master switch was pointing toward the automatic position but did not operate correctly. Examination of the ELT revealed two small cuts in the master switch protective rubber boot. The automatic switch contact points in the interior of the switch were contaminated with significant quantities of copper, cadmium, and sulphur. The actuating pin in the master switch was also bent. When the ELT was tested, it produced a usable signal in the on position; however, when the switch was selected to the automatic position, only a very faint and unusable signal was detected. The inertia switch was examined and operated normally. The ELT had been modified to fit into the aircraft mounting bracket, and neither the modification nor the installation of the ELT had been approved by the Department of Transport (DOT).

ANALYSIS:

The aerial photography flight required the pilot to fly at low altitudes over difficult terrain and close to obstacles. When the passenger was attempting to photograph the pickerel spawning bed located in the steep, tree-covered river valley, the low-time pilot, who had not been trained in this type of operation, manoeuvred the helicopter within the river valley, and the main rotor struck a tree. After the tree strike, the pilot lost control of the helicopter, and it crashed.

Because the company chief pilot did not know the exact route to be flown or the ETA at Parry Sound, no search and rescue activity was initiated until almost 12 hours after the accident, even though the helicopter only had two hours of fuel on board when it departed Emsdale. Had the pilot filed a flight plan, flight notification or flight itinerary, a flight watch as per the company operations manual would have been in effect for the flight, and the fact that the helicopter was missing would have been realized sooner. Since the pilot had not flown an aerial photography flight for the company before and had not been properly trained by the company for his duties, he was not qualified to fly the flight. Despite these omissions in flight training and flight planning, the company chief pilot authorized the flight.

The search was hampered because the accident site was barely visible from the air, and no usable ELT signal was detected. The ELT failed to produce a detectable signal because of the contaminated master switch and bent actuating pin. Although the source of contamination could not be determined, the small cuts in the master switch protective boot suggest it was present before the accident. Since the ELT was found detached from the mounting bracket, the damage to the actuating pin most likely occurred during the accident sequence.

CONCLUSIONS:

Findings:

1. The pilot had not received the company's minimum flight training before the flight and had no previous aerial photography experience with the company.

2. The flight was conducted without a flight plan, flight notification, flight itinerary, or flight watch.

3. No one except the crew knew the exact route to be flown or the estimated time of arrival at Parry Sound.

4. The company chief pilot allowed the flight to proceed although it did not comply with the company operating procedures or DOT regulations.

5. The ELT had been modified and installed in the helicopter without the approval of DOT.

6. The helicopter crashed after the main rotor blades struck a tree.

7. A damaged and contaminated master switch prevented the ELT from emitting a usable signal after the accident.

8. An intensive three-day aerial search failed to locate the crash site.

Causes:

The main rotor blades struck a tree while the pilot was manoeuvring close to the ground.

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CAN-ARC HELICOPTERS LTD.
BELL 214B-1 (Helicopter) C-GVXC
GOLDEN, BRITISH COLUMBIA 65 mi NW
11 OCTOBER 1987

REPORT NUMBER: 87-P70089 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1645 MST
OPERATION: Specialty Other
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6,111	1,100
LAST 90 DAYS	290	290

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

The helicopter, engaged in heli-logging on a rugged mountainside, was returning up the mountain after dropping a load of logs when the captain felt a sudden yaw and heard the engine (T5508D) stop; he immediately lowered the collective part way. The co-pilot, seeing the engine oil pressure light illuminate and hearing the low rotor warning horn, pushed the collective all the way down. The captain then pulled the collective fully up as the helicopter crash-landed on a tree stump. The captain suffered minor head cuts, and the co-pilot was unhurt; the aircraft was substantially damaged. Neither pilot was wearing a helmet.

There were no pre-impact deficiencies found in the airframe. When the engine was examined, it was found that the accessory drive bevel gear (part number 2-080-013-034) had failed. This gear drives the fuel control unit, the engine oil pumps, and the N1 tachometer.

Avco Lycoming had issued a series of Service Bulletins regarding the accessory drive gearbox of the T5508 engine. These bulletins called for various inspections and modifications to be made the next time the engine was returned to an Avco Lycoming authorized service centre for any reason. The bulletins stated that "failure to comply with the service bulletins could result in premature failure of the gearbox." After the engine had logged 3955.3 hours, it was repaired on 17 July 1987 at an authorized Avco Lycoming service center, and a new data plate was installed, but compliance with the service bulletins was not requested by the owner and was not carried out.

Service Bulletin No. 5808-0032, Inspection and Replacement of Accessory Gearbox Bevel Gear Part Number 2-080-013-03L, calls for a one-time inspection to ensure that all gearboxes incorporate an improved accessory drive bevel gear, revision N or later. The revision N or later bevel gears are of a thicker material and are not chrome-plated in the radius area.

It was found that the accessory drive bevel gear in the accident helicopter had failed due to high-cycle low-stress fatigue cracks originating in the fillet area on the outside diameter of the shaft. When the gear failed, there was a sudden and complete loss of engine power because the fuel control unit was no longer driven.

The engine manufacturer, aware of the weakness in the bevel gear, had issued Service Bulletin 5808-0032 requiring this gear to be replaced the next time the engine was at one of their authorized service centres; however, compliance with manufacturers' Service Bulletins is not mandatory, and this bulletin was not complied with when the engine was at an authorized centre three months prior to the failure.

Neither pilot was wearing a helmet at the time of the accident, and the captain struck the side of his head during the crash sequence. While his injuries were not serious, they may have been prevented had he worn a helmet.

CONCLUSIONS:

Findings:

1. Bevel gear part number 2-080-013-03L failed from a high-cycle low-stress mode of fatigue.

2. The failure of the bevel gear caused a sudden and total loss of engine power, and the pilot made a forced landing on rough terrain.

3. Lycoming Service Bulletin 5808-0032 had not been complied with.

4. There is no mandatory requirement for operators to comply with engine manufacturers' Service Bulletins.

5. Neither pilot was wearing a helmet.

6. The captain received minor head injuries which may have been prevented had he worn a helmet.

Causes:

The helicopter engine suddenly stopped when an accessory gearbox bevel gear failed from a high-cycle low-stress mode of failure.

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WESTLAND HELICOPTERS
BELL 206B JETRANGER (Helicopter) C-GRJH
NEWMAN PENINSULA, BRITISH COLUMBIA
21 OCTOBER 1987

BRIEF NUMBER: 87-P70096 (Accident)
LOCAL TIME: 1630 PST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	10,965	7,565
LAST 90 DAYS	171	171

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The helicopter was engaged in flying forestry personnel for the purpose of pine beetle probing. While manoeuvring to land in a clearing to pick up personnel, the helicopter descended into the top of a dead cottonwood tree. The pilot was turning into the setting sun and did not see the dead tree which blended in with the horizon. Damage was limited to broken chin bubbles and the main rotor blades. The pilot indicated that the accident would not have occurred had he not descended below tree height while facing into the setting sun.

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WHITE SADDLE AIR SERVICES LTD.
BELL 206B JETRANGER (Helicopter) C-GCHK
BLUFF LAKE, BRITISH COLUMBIA 2 mi N
27 OCTOBER 1987

REPORT NUMBER: 87-P70093 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1645 PST
OPERATION: Specialty Aerial Control
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6,800	5,400
LAST 90 DAYS	250	250

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The helicopter was on a flight to home base at Bluff Lake, British Columbia after a day of flying forestry personnel to various forest fires. The engine suddenly lost power, and the pilot immediately entered an autorotation and transmitted a MAYDAY message stating that his engine had failed and that he was making a forced landing. As there were no suitable landing areas, the pilot selected a spot where the jack pine trees appeared to be less dense and landed the helicopter. The aircraft shook violently as the main rotor blades chopped through the trees, and one tree penetrated the helicopter's fuselage in the back seat area, rupturing the fuel cell. The helicopter came to rest in a nose-down attitude with the left skid touching the ground and the end of the tail boom 14 feet up in the trees. The helicopter was substantially damaged, but the pilot was unhurt. The pilot was wearing a shoulder harness and safety helmet, both of which helped prevent any injury during the violent descent through the trees.

The engine (Allison 250-C20) was removed for examination after the accident. The compressor had accumulated 999.9 hours toward its scheduled overhaul time of 3,500 hours. The compressor section had two blades missing from the second stage stators, and there was evidence of damage to all sections aft of the second stage. Laboratory analysis of the compressor section revealed that the second stage stator blades had failed in overload following extensive fatigue cracking. There was also significant erosion damage which reduced the blade thickness. When the stator blades failed, damage resulted to the compressor blades, and the engine lost power.

CONCLUSIONS:

Findings:

1. There was significant erosion damage to the second stage stator blades which reduced the blade thickness.

2. Two second stage compressor stator blades failed in overload following extensive fatigue cracking.

3. The engine lost power in flight, forcing the pilot to land into the trees.

4. The pilot was wearing a shoulder harness and safety helmet and escaped unhurt.

Causes:

Two stator blades failed, resulting in damage to the compressor and causing the engine to lose power.

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UNIVERSAL HELICOPTERS
NEWFOUNDLAND LTD.
BELL 206L JETRANGER (Helicopter) C-GJBC
GOOSE BAY, NEWFOUNDLAND 37 mi NE
31 OCTOBER 1987

REPORT NUMBER: 87-A70034 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1545 ADT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	800	400
LAST 90 DAYS	231	231

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

HISTORY OF THE FLIGHT:

The helicopter was en route from Makkovik, Newfoundland to Goose Bay, Newfoundland. On the way, the pilot decided to land on a bog near a lakeshore. He circled the lake at an altitude of approximately 600 feet above ground level and, from a position over the water, commenced a descent for landing. At this time, the engine (Allison 250 C20B) lost power, and the engine-out light and the engine-out audio warning activated. This was followed by a low rotor rpm warning light and the auto-ignition light. In an attempt to reach the bog, the pilot increased collective to stretch the glide and then increased collective further to clear the trees at the shoreline. When the helicopter was over the trees, the pilot started to flare in an attempt to soften the landing, but this had little effect, and the helicopter landed heavily. The skids dug into the bog, the tail boom was sheared off by the main rotor blades, and the helicopter rolled over onto its left side. The engine was running after the crash, and the pilot turned the fuel valve off; however, the engine did not stop until the pilot rolled off the throttle.

PERTINENT INFORMATION:

Examination of the helicopter at the scene did not reveal any abnormalities that would have contributed to the loss of power.

The wreckage was slung out by helicopter and transported to a hangar at Goose Bay Airport where an external inspection was completed.

The engine was removed and sent to the CASB, Moncton, New Brunswick for examination. It was disassembled, and no abnormalities were found that would have caused a flame-out or a deceleration.

The engine fuel system and ignition system accessories were functionally tested and found to be operating normally. The fuel system accessories were disassembled and found to be serviceable.

Fuel samples from the airframe fuel filter and the front fuel tank met the required specifications and did not contain any contaminants.

Oil samples from the accessory gearbox and engine oil were found to be typical of a synthetic ester-type turbine engine lubricant.

There was a small amount of sediment on the oil filter screen, but this was not considered to be related to the engine failure.

Fifteen minutes after the accident, at 2000 UTC, the weather at Goose Bay (37 miles west of the accident scene and the nearest weather reporting station) was 4,000 feet scattered, 23,000 feet scattered, temperature two degrees Celsius, and wind 250 degrees true at eight knots. There was no precipitation.

ANALYSIS:

As the auto-ignition had activated, it could not be determined if the engine had flamed out and relit or if it had decelerated. As the aircraft was over the lake when the engine problem occurred, the pilot had to choose between landing in the water or attempting to glide to the bog. He did not want to autorotate into the water; therefore, he decided to attempt to reach the bog. Because the rotor rpm had decayed, a hard landing was unavoidable.

CONCLUSIONS:

Findings:
1. The engine either decelerated or flamed out and relit.

2. During the attempt to glide to the bog, rotor rpm decayed to the point that a hard landing was inevitable.

Causes:
The cause of the deceleration or flame-out was not determined.

NORTHERN MOUNTAIN HELICOPTERS INC.
HUGHES 500D (Helicopter) C-GVCG
JEWETT LAKE, ONTARIO
10 NOVEMBER 1987

REPORT NUMBER: 87-C70090 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0825 EST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,150	1,400
LAST 90 DAYS	200	67

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	2

SUMMARY REPORT:

The helicopter landed at a drill site to off-load one passenger. Once the passenger was clear, the pilot lifted off and was climbing vertically out of the confined area when the helicopter suddenly swung to the right through 180 degrees. Seconds later, the helicopter pulled violently to the right; it then rolled 90 degrees to the right, descended, and struck the ground.

A parcel of drill rods had been placed six feet away from the helicopter landing pad; they were tied by a standard 25-foot cable used to sling rods. The passenger who had been dropped off saw the helicopter rise and noticed the cable hooked to one of the skids. The passenger in the right front seat noticed that the drill rods had been picked up by the helicopter but was unable to warn the pilot before the accident occurred.

After the accident, cable marks were found on the right skid, and skid paint was found on the cable.

The end of the sling cable had been left to lie on the landing pad, but the pilot was unable to see this obstruction because of the snow whirling around the helicopter while the passenger disembarked. On lift-off, the curved tip of the right skid snagged the cable, and, when the helicopter rose, it slowly pulled the cable with it. When the drill rods were picked up, the helicopter turned 180 degrees, and the swinging rods caused the violent pull to the right, resulting the pilot's losing control of the helicopter.

It could not be determined who left the cable on the landing pad. The accident could have been prevented had procedures been in effect requiring drill crews to ensure that landing pads are free of obstructions at all times.

CONCLUSIONS:

Findings:
1. The helicopter's right skid snagged the cable.

2. The pilot lost control of the helicopter when the sling load on the skid was lifted.

3. Procedures were not in effect to ensure that the helicopter landing pad was free of obstructions, and a sling cable was left lying on the pad.

Causes:
During lift-off, the right skid snagged a sling cable attached to a bundle of drill rods. The rods began to swing as they were lifted from the ground, causing forces to be applied to the helicopter which resulted in the loss of control.

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YUKON HELICOPTERS LIMITED
BELL 47 J2 (Helicopter) C-FSFG
ISLAND LAKE, MANITOBA
19 NOVEMBER 1987

BRIEF NUMBER: 87-C74101 (Incident)
LOCAL TIME: 1630 CST
OPERATION: Charter
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	255	255
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot landed the helicopter and shut the engine off, but the rotor blades were still turning. Another helicopter was approaching to land in the confined area. The downwash from the landing helicopter struck the slowly rotating blades of the parked aircraft, causing them to strike the tail boom.

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LES HÉLICOPTÈRES ABITIBI LTÉE
BELL 206B (Helicopter) C-FQCJ
MATAGAMI, QUÉBEC 25 mi W
19 NOVEMBER 1987

REPORT NUMBER: 87-Q70056 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1400 EST
OPERATION: Specialty Aerial Construction
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,500	50
LAST 90 DAYS	155	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The helicopter was being used to transport fuel barrels in a sling. While hovering on a southerly heading, the pilot repositioned the helicopter to attach the sling. During the manoeuvre, the helicopter's right skid contacted another barrel nearby, and the helicopter rolled over on its right side. The pilot shut down the engine and exited without difficulty.

PERTINENT INFORMATION:

Earlier that day, the pilot had performed similar work with a different type of helicopter. He had accumulated a total of 50 hours on the Bell 206B, two hours of which had been accumulated during the last 90 days. The flying characteristics of the Bell 206B are more sensitive than the other types on which the pilot had accumulated most of his flying time.

The load pick-up area was surrounded by high trees. Other fuel barrels located nearby on higher ground were standing upright and were frozen in position. The ground in the pick-up zone was uneven to such a degree that the pilot had to manoeuvre the helicopter with its skids below the level of the adjacent barrels in order to attach the load with a sling which was of insufficient length for the type of operation. The wind in the area was blowing from the south-southwest at 10 to 15 knots, with gusts up to 25 knots.

ANALYSIS:

Because of the the location of the load and the length of the sling, the pilot had to manoeuvre the helicopter with its skids below the level of adjacent fuel barrels. While manoeuvring to reposition the helicopter to attach the load, the right skid contacted a barrel. This produced a rolling movement to the right and induced dynamic roll-over. The rate of roll then increased because the lift produced by the rotor disc had become inclined, and it converted into thrust. Since this occurs at a point well above the centre of gravity, a rate of roll is rapidly induced which then becomes impossible to control.

CONCLUSIONS:

Findings:
1. The pilot had accumulated only two hours on type during the last 90 days.

2. The length of the sling was insufficient for the type of operation.

3. The right skid struck a fuel barrel, and the resultant dynamic roll-over prevented the pilot from regaining control of the helicopter.

Causes:
The pilot attempted to pick up a load with a sling which was inadequate for the type of operation. After the skid struck a fuel barrel, dynamic roll-over prevented the pilot from regaining control of the helicopter.

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GREAT SLAVE HELICOPTERS LTD.
BELL 206B JETRANGER (Helicopter) C-FBFH
SLEMON LAKE, NORTHWEST TERRITORIES
28 NOVEMBER 1987

REPORT NUMBER: 87-W70082 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1615 MST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	550	450
LAST 90 DAYS	95	95

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was engaged in transporting a diamond drill crew from a drill site to the base camp, about 15 miles

away. As the helicopter approached a snow-covered lake about two miles from the camp, the pilot encountered fog and whiteout conditions. A precautionary landing was carried out onto the lake, using the trees on the shoreline for reference. At this point, the pilot decided to walk to base camp and come back for the helicopter the following morning, weather permitting.

Because of the dense fog and whiteout conditions, the drill crew decided to walk toward the camp in a relay style with the last man keeping the helicopter in sight until the lead man could see the camp. To assist the men on the ground, the pilot decided to stay with the helicopter, with the engine running and the landing light pointing in the general direction of camp. The pilot discussed these arrangments on the radio with the camp manager, who was to walk out from camp and assist the men on the ice. As the men walked out across the ice, the pilot flew the helicopter up into a hover and decided to air taxi back to camp by following the men's footprints in the snow. Approximately mid-way across the lake, the pilot saw the camp lights at about the same time as he air taxied over the lead man; he then flared the helicopter to come into a hover; however, during the flare, the helicopter climbed. The pilot then lost visual reference, and the helicopter flew into the ice in a steep, nose-down attitude, sliding about 150 feet before coming to a stop. The impact forces destroyed the helicopter; the pilot escaped with minor injuries.

With the men walking in the snow and leaving deep tracks, the pilot had some contrast. The men's dark winter clothing was discernible, giving the pilot both the apparent visibility and contrast he wanted for flight, and, as a result, he decided to air taxi to base, following the men and their tracks with the aid of his landing light. Upon air taxiing over the lead man, the pilot, who had the camp lights in sight, decided to flare and enter a hover, thus enabling him to keep the men in sight. During the flare, the landing light was pointing up into the fog, and visual reference was lost, causing the pilot to become disoriented and crash.

CONCLUSIONS:

Findings:

1. The pilot encountered reduced visibility and whiteout conditions, and carried out a precautionary landing.

2. The pilot resumed the flight after he had landed with the intention of shutting down.

3. The men in dark clothing walking along the ice were leaving discernible marks, giving the pilot the apparent visual cues he required to fly the helicopter back to home base.

4. During the flare to enter a hover, the helicopter climbed, and the pilot lost visual reference, became disoriented, and crashed.

Causes:

The pilot attempted to taxi across a frozen lake under whiteout conditions.

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SEALAND HELICOPTERS LTD.
BELL 206B JETRANGER (Helicopter) C-GAII
BEACHY COVE, NEWFOUNDLAND
23 DECEMBER 1987

REPORT NUMBER: 87-A70037 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1101 NST
OPERATION: Commercial Non-Revenue
DAMAGE: Destroyed
PILOT LICENCE: Commercial Helicopter

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,600	3,800
LAST 90 DAYS	120	106

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The helicopter departed St. John's Airport, Newfoundland for Kelly's Island, with a planned stop en route at Beachy Cove to pick up a crew to carry out a slinging operation. The pilot circled the landing site to check the approach path, which was over a wooded area, before setting up his approach for landing. While the aircraft was on short final for landing, at about 150 feet above tree-top level, the pilot heard a "poof" sound, the engine-out horn sounded, and the rotor rpm started to decrease. The pilot pressed the starter button and kept the starter engaged in an attempt to re-light the engine (Allison 250-C20) and tried to glide the helicopter over the trees to reach the edge of a clearing. The low-rotor horn then sounded, and the pilot, realizing that he would not reach the clearing, used full collective and aft cyclic to cushion the impact with the trees; the helicopter came to rest on its right side in a nose-down attitude, with the engine still running. The pilot tried to close the fuel valve but was unable to do so because the fuel valve knob had broken off during the crash; he exited the helicopter, and the engine stopped after about two minutes.

The engine was disassembled, and no problems were found, other than impact damage to the exhaust collec-

tor. The engine fuel system components and the bleed air valve were bench-tested and found to meet service limits; these components were disassembled, and no discrepancies were found that would have caused them to malfunction.

It was determined that there was adequate fuel on board at the time of the occurrence and that the boost pumps were switched on and were functioning properly. There was no evidence of any leaks or loose "B" nuts.

Fuel samples from the aircraft fuel tank were free of water, sediment, or suspended matter and met the Canadian General Standards Board requirements for turbine fuel. The fuel samples from the airframe fuel filter and the engine fuel pump filter contained fibres, silicone, and fine wear particles consisting mainly of copper. The particles found in the filters are typical of those found in refuelling systems. The high-pressure fuel filter, which is downstream from the engine fuel pump, was free of contaminants, and, therefore, the fuel delivered to the fuel control unit and the fuel nozzle was free of contamination.

The pilot kept the starter engaged after the engine-out horn had sounded, and the engine was running after ground impact; it could therefore not be determined whether the engine had flamed out and re-lit, or whether it had decelerated. No faults were found that would have caused the engine to malfunction.

CONCLUSIONS:

Findings:
1. The engine either decelerated or flamed out.

Causes:
The engine lost power for undetermined reasons.

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VIKING HELICOPTERS LTD.
AEROSPATIALE AS350D ASTAR
(Helicopter) C-GMIZ
BRISAY, QUÉBEC
02 JANUARY 1988

BRIEF NUMBER: 88-Q0003 (Accident)
LOCAL TIME: 0913 EST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,215	39
LAST 90 DAYS	34	34

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

CIRCUMSTANCES:

The aircraft had been chartered by Hydro-Québec to carry personnel from La Grande 4 to the Brisay camp in Québec. The flight was made under visual flight rules (VFR).

During the approach, and in preparation for landing at Brisay, the helicopter was hovering approximately three feet above the ground, when the controls became extremely stiff following failure of the hydraulic system. The pilot did not observe any abnormal readings on the instrument panel. The helicopter became difficult to control and went into a nose-up attitude. The tail struck the ground, and the helicopter rotated to the right. The pilot climbed to verify the hydraulic system and then landed the helicopter without further incident using manual controls.

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INTERLAKE AVIATION LTD.
BELL 206A (Helicopter) C-GRWR
GIMLI, MANITOBA
06 JANUARY 1988

REPORT NUMBER: 88-C0007 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1225 CST
OPERATION: Specialty Training
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,250	450
LAST 90 DAYS	150	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

The ski-equipped helicopter had departed the ramp for a training flight, within the confines of the airport, to practise rapid decelerations or quick stops. After completing one circuit, the instructor pilot took control in order to place a reference mark in the snow which would be the starting point for the exercise to follow. While the helicopter was moving forward with the skis on the ground, the right ski broke through a crust of snow, and the helicopter rolled to the right.

The pilot decided to use this portion of the in-field for training rather than the usual area, as he could accomplish two quick stops on each circuit. The snow depth in the area varied because of drifting, and there was a crusty surface. The skis had been installed over the skids, which would have caused forward travel to be restricted once the ski broke through the surface crust.

There was a 40-degree cross-wind from the left at 11 gusting to 19 knots. The pilot could not recall the control inputs that he made, but it is possible that there was some collective application.

When the helicopter is on the ground, the primary helicopter dynamic upsetting moments are due to rotor flapping. In a strong cross-wind, such as in this occurrence, the moment the collective is raised, the cross-wind creates non-symmetrical aerodynamic forces which produce rotor flapping and a resultant angular thrust of the main rotor. If the pilot does not compensate for the disc tilt with cyclic and one landing gear comes off the ground with only partial thrust on the rotor, a roll-over may be starting.

When the right ski broke through the snow crust as the aircraft was being skidded forward, the interruption in the forward movement of the aircraft resulted in an angular velocity about a pivot point, and the aircraft became light on one gear. This movement, possibly aggravated by the application of collective, resulted in a dynamic roll-over.

CONCLUSIONS:

Findings:
1. The pilot was manoeuvring over an area that was covered by a crust of snow.

2. While the helicopter was moving forward, the right ski broke through the crust, providing a pivot point and momentum that resulted in a dynamic roll-over.

Causes:
The area selected for manoeuvring was inadequate.

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BELL 206B (Helicopter) C-FZXP
CORNER BROOK, NEWFOUNDLAND
11 FEBRUARY 1988

BRIEF NUMBER: 88-A0038 (Accident)
LOCAL TIME: 0830 NST
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	12,520	1,085
LAST 90 DAYS	26	26

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	4

REPORTED CIRCUMSTANCES:

There was one and one-half to two inches of fresh snow on the ground when the pilot started the helicopter and positioned it in the hover. The pilot initially had visual ground reference; however, the rotor wash stirred up the snow, and the pilot lost reference with the ground. The pilot was not aware that the helicopter was drifting backwards until he felt it strike something. He quickly lowered the collective, and the helicopter landed hard, bending the forward cross-tube of the landing gear. The tail rotor and vertical fin were damaged when they struck the overhang of a building located behind the helicopter.

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AÉROSPATIALE AS-350D ASTAR
(Helicopter) C-GSSI
SAINTE-CROIX, QUÉBEC 5 mi W
23 FEBRUARY 1988

REPORT NUMBER: 88-Q0031 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2130 EST
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	8,000	85
LAST 90 DAYS	130	85

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The pilot was flying at night in accordance with visual flight rules (VFR) from Montréal/Dorval Airport to the Québec Airport. En route, the pilot encountered snow showers, forcing him to turn around. During the turn, the helicopter struck a tree and crashed to the ground. One passenger suffered minor back injuries; the pilot and second passenger were unhurt.

The pilot had checked the weather conditions by telephoning the Environment Canada office at Dorval before the flight; he then filed a VFR flight plan, stating that his destination was the Québec Airport. En route, he landed at the Port of Montréal to pick up two passengers, as he was to fly them to Sainte-Croix de Lotbinière.

Although no snow showers were forecast for the Québec and Montréal airports, the Québec area forecast called for isolated snow showers with reduced visibility. While flying over Saint-Louis de Lotbinière, 15 miles west of Sainte-Croix de Lotbinière, the pilot encountered snow showers. He landed in the yard of the Lotbinière church, and the weather improved while he was on the ground. A few minutes later, in a telephone conversation with the Québec Flight Service Station (FSS), the pilot was told that conditions at the Québec Airport were suitable for VFR flight.

The pilot and his passengers took off for Sainte-Croix de Lotbinière. While flying over the former Sainte-Croix Airport, the pilot encountered more snow showers. At the same time, the Québec FSS advised him that visibility was deteriorating at Québec as a result of snow shower activity. In an effort to turn around and seek better weather, the pilot flew over the St. Lawrence River. While turning around in the snow showers, the pilot tried to maintain visual contact with the ground. The helicopter lost altitude, however, and the main rotor struck a tree on shore. The pilot lost control, and the aircraft crashed to the ground.

The pilot had received instrument training and had some experience, but the helicopter was not certified for instrument flight rules (IFR) flight.

Based on local conditions and the information provided by the Québec FSS, the pilot decided to continue the flight. The pilot, in his attempt to turn around in snow showers and maintain visual contact with the ground, did not realize that the helicopter had lost altitude. The helicopter struck a tree on the shore and crashed.

CONCLUSIONS:

Findings:
1. The pilot did not do a proper analysis of all the meteorological information at his disposal, and he encountered snow showers en route.

2. While the pilot was turning around, the helicopter struck a tree and crashed.

Causes:
The pilot did not realize that the helicopter was losing altitude during the turn.

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TRANSPORT CANADA
BELL 206B JETRANGER (Helicopter) C-FDOI
CHERRY ISLAND LIGHT STATION,
NEW BRUNSWICK
09 AUGUST 1987

REPORT NUMBER: 87-A70028 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1430 ADT
OPERATION: State
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	8,000	3,600
LAST 90 DAYS	65	65

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The Bell 206 helicopter was operating in support of the hydrographic survey vessel Baffin, in Passamaquoddy Bay, New Brunswick. As a requirement of the survey, the flight proceeded to the Cherry Island Light Station. While carrying out pre-landing reconnaissance, the pilot observed a wooden, weather-beaten landing pad which was partially covered with foliage. He concluded that the pad was not serviceable for use and landed on the grass beside the lighthouse. On landing, the skids of the helicopter did not contact the ground firmly, and the helicopter started to settle unevenly. The pilot heard a snap, and observed a fresh scrape mark on the metal trim of the lighthouse. Realizing that a main rotor blade strike had taken place, the pilot hovered the helicopter away from the building to carry out a check of the flight controls. The controls were smooth, vibration free, and responded normally.

The pilot believed the rotor damage to be minor, and, not wanting to land in an area that he had already rejected, he returned to the ship. Following a four-minute flight, the helicopter landed safely on the Baffin.

CONCLUSIONS:

Findings:
1. The grass area selected for the landing was uneven and close to the lighthouse.

2. The helicopter settled unevenly to the ground, and the main rotor blade struck the lighthouse.

Causes:
The landing area selected by the pilot was not suitable for helicopter landing operations.

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RCMP AIR SERVICES
BELL 206B JETRANGER (Helicopter) C-GRVM
CLOUDBURST MOUNTAIN, BRITISH COLUMBIA
14 AUGUST 1987

REPORT NUMBER: 87-P70069 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1115 PDT
OPERATION: State
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6,000	5,200
LAST 90 DAYS	150	150

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	1	-

HISTORY OF THE FLIGHT:

The pilot with one passenger and some equipment on board departed from the Vancouver International Airport for a flight to Cloudburst Mountain, British Columbia, about 45 miles to the north. The purpose of the flight was to install electronic equipment at a radio repeater site located on top of a mountain at 6,000 feet above sea level (asl). The flight was uneventful, and, on reaching the landing site, the pilot circled to assess the wind and to select a suitable landing site near the repeater antenna. Having done this, the pilot was turning away to make the final circuit when the helicopter, at an airspeed of 15 mph, began to descend. The pilot was unable to arrest the descent, and the helicopter struck the ground and rolled over onto its side, seriously injuring the passenger.

PERTINENT INFORMATION:

Examination of the helicopter after it was removed from the mountain did not reveal any evidence of pre-impact failure of the engine, airframe, or controls. The helicopter had been properly maintained and was airworthy at the time of the accident. The pilot was properly licensed and had considerable mountain-flying experience.

The weather as reported by the pilot was good for visual flight rules flight at the time of the accident, and the wind was light and variable. During the salvage operation later in the day, there were reports of numerous, sudden reversals in the wind direction with significant velocity changes.

When the engine was removed for testing, it was found that the first four stages of the compressor had sustained

foreign object damage (FOD) during the accident sequence. As the engine could not be test run, the major engine components were bench-tested by an engine overhaul company. The test results were slightly below specification in two areas, but the performance of the engine was not significantly affected. There was no evidence of previous engine problems or loss of power. The pilot did not report an engine-out warning or low-rotor-rpm horn prior to impact.

ANALYSIS:

During landings on mountain tops, helicopters are often subject to extremely variable winds, such as were present in this case. Since the helicopter had an airspeed just before it descended of about 15 mph, which is the lower limit of translational lift, a sudden reversal of wind direction would have resulted in a reduction in horizontal air flow through the rotor disc. Once out of translation, the helicopter would have been effectively hovering out of ground effect; this requires considerably more power and is limited by the helicopter's weight, the air temperature, and the altitude. According to the Bell 206B flight manual, the helicopter was at or near the hovering out of ground effect limits at the time of the accident. A sudden loss of translational lift caused by a wind shift allowed a rate of descent to develop which the pilot did not arrest before the helicopter struck the ground.

CONCLUSIONS:

Findings:

1. The mountain site elevation was at or near the helicopter's ceiling for hovering out of ground effect.

2. The wind speed and direction were variable at the mountain top landing site, causing the helicopter to lose translational lift.

3. The pilot did not arrest the helicopter's descent before it struck the ground.

Causes:

Variable winds caused the helicopter to descend when translational lift was lost. The pilot did not arrest the descent before the helicopter struck the ground.

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CENTRE DE FORMATION AÉRONAUTIQUE GAMELIN
CHALLENGER II (Ultralight) C-IFQR
BUCKINGHAM, QUÉBEC
JULY 25, 1987

BRIEF NUMBER: 87-Q75006 (Accident)
LOCAL TIME: 2025 EDT
OPERATION: Flying Club Training
DAMAGE: Substantial
LICENCE: Commercial Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	150	110
LAST 90 DAYS	48	47

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

After the run-up, the instructor authorized the student to take off. After the take-off, at an altitude of 100 feet above ground level, the engine lost power. The instructor immediately took over the controls of the ultralight aircraft to make an emergency landing; the aircraft crashed into the trees at an approximate speed of 10 km/h.

The instructor believes that the power loss was caused by a sporadic carbon deposit on one of the two igniter plugs.

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HODKINSON PH-4 (Amateur-built) C-GKGH
BRAMPTON AIRPORT, ONTARIO
31 JULY 1987

REPORT NUMBER: 87-O/70058 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1905 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	546	42
LAST 90 DAYS	17	17

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot departed Brampton Airport on a local flight. The aircraft was about 200 feet above ground in the climb-out, when the engine (Volkswagen 1700cc) began to vibrate violently. The pilot closed the throttle and landed in a cornfield 2,200 feet from the end of the runway, substantially damaging the aircraft.

The fibreglass spinner, which was also amateur-built, had been installed at least 17 flying hours prior to the accident. Pieces of fibreglass from the spinner were found in a field 800 feet from the end of the runway. When these pieces separated, the resultant propeller imbalance caused the severe vibration. Examination of the engine, airframe, and controls did not reveal any other faults.

CONCLUSIONS:

Findings:
1. Breakup of the fibreglass propeller spinner caused an imbalance of the propeller system and severe vibration.

2. The aircraft was damaged during the forced landing.

Causes:
Breakup of the fibreglass propeller spinner resulted in severe vibration and a forced landing.

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BABY GREAT LAKES (Amateur-built) C-GEWL
BRADFORD, ONTARIO 8 mi N
01 AUGUST 1987

BRIEF NUMBER: 87-O/70057 (Accident)
LOCAL TIME: 1650 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	220	8
LAST 90 DAYS	6	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot had completed several practice touch-and-go landings. On approach for a full-stop landing, the aircraft descended rapidly and struck the ground 30 feet short of the grass runway. The right gear collapsed, and the aircraft nosed over approximately 50 feet from the point of touchdown.

The pilot attributed the sudden loss of lift to wind shear; the wind was light and variable.

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AIR COMMAND GYROPLANE UNREGISTERED
FORT SMITH, NORTHWEST TERRITORIES
18 mi W
02 AUGUST 1987

REPORT NUMBER: 87-W75006 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1700 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: None

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6	0.1
LAST 90 DAYS	0	0.1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was practising taxiing his amateur-built gyroplane in a remote area of salt flats west of Fort Smith. On one run, the pilot unintentionally applied too much power, and the gyroplane became airborne and climbed steeply to an estimated altitude of 500 feet before the pilot was able to level off. In an attempt to get back on the ground, a large figure-eight pattern was flown over the salt flats, followed by a gradual descent toward the departure area. At an altitude of about 20 feet, the pilot closed the throttle, and the gyroplane dropped rapidly in a turn to the right. The rotor struck the ground, followed by a heavy landing on the nose gear.

The pilot's only previous flying experience was approximately six hours dual in a gyroplane towed behind a truck, about one year prior to the accident flight. He was therefore not familiar with the flying characteristics of the gyroplane under its own power.

The weather conditions were suitable for flying the gyroplane although the surface wind was gusting to 16 knots. The aircraft appeared to have been well built and was fully serviceable prior to the accident.

The pilot's lack of experience resulted in the gyroplane becoming airborne unexpectedly and climbing steeply

before the pilot could gain control. In his attempt to land the gyroplane, the pilot's lack of familiarity with the effect of a sudden reduction in power resulted in a loss of lift and a hard landing.

FINDINGS:

Cause Related:
1. Due to his lack of experience, the pilot unintentionally caused the gyroplane to become airborne while practising taxiing.

2. The pilot suddenly reduced the power while the gyroplane was 20 feet above the ground, causing a hard landing.

Other:
-Nil-

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BEAVER SPECTRUM (Ultralight) C-IFVU
SAINT-LUDGER-DE-MILOT, QUÉBEC 15 mi N
02 AUGUST 1987

REPORT NUMBER: 87-Q75008 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1630 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Student Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	10	10
LAST 90 DAYS	10	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was on a recreational flight from Saint-Ludger-de-Milot to Saint-Méthode de Dolbeau, Québec. After taking off and gaining altitude, the aircraft was seen flying in a circle over the same spot, at the same altitude, for approximately 45 minutes. The next day, friends of the pilot inquired as to whether he had reached his destination, and, when it was learned that the aircraft had not arrived, a search was initiated. The wreckage was found in a wooded area about 15 miles north of Saint-Ludger-de-Milot. The pilot had been killed.

An inspection of the aircraft on site revealed no technical problems which could have contributed to the accident. Weather conditions were favourable for this type of flight.

An autopsy showed that the pilot had died in flight of an acute myocardial infarction. An examination of the pilot's medical history revealed that he was a diabetic and that he had a cardiac condition. He was on sick leave at the time of the accident and was to undergo a second heart operation.

The pilot had purchased his ultralight shortly before the accident and had flown a few hours without training. He then registered for an ultralight pilot's course. When he completed his application for an ultralight student pilot licence, the pilot stated that he did not have diabetes, a cardiac condition, or any other health problems. The medical form, which must be signed by the applicant, stipulates that all health problems must be declared at the time of the medical examination.

The pilot was flying an ultralight aircraft while suffering from a cardiac condition which he did not declare to the Transport Canada medical examiner, contrary to regulations. He died in flight of an acute myocardial infarction.

CONCLUSIONS:

Findings:
1. The pilot, who had a cardiac condition, suffered an infarction in flight.

2. Contrary to the regulations, the pilot had not declared his diabetes and cardiac condition to the Transport Canada medical examiner.

Causes:
The pilot died in flight of an acute myocardial infarction.

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BLUENOSE SOARING CLUB
SCHLEICHER KA8 (Glider) C-FRCE
STANLEY, NOVA SCOTIA
03 AUGUST 1987

BRIEF NUMBER: 87-A70027 (Accident)
LOCAL TIME: 1445 ADT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Glider

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	246	25
LAST 90 DAYS	21	18

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The glider was taking off on a winch launch. When the glider was approximately 50 feet above ground level and at an airspeed just above the stall, the cable began to slacken. The pilot waited two seconds for the cable to tighten, but, because a problem had developed in the winch transmission, the cable did not tighten. He attempted a release, but the cable did not release immediately. When the cable finally did release, the aircraft was descending rapidly in a near stalled condition, with insufficient altitude to recover. The aircraft landed hard on the landing wheel, causing substantial damage.

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STOLP STARDUSTER TOO (Amateur-built)
C-GFJG
PETROLIA, ONTARIO
06 AUGUST 1987

BRIEF NUMBER: 87-O/70059 (Accident)
LOCAL TIME: 2030 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	94	18
LAST 90 DAYS	3	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The amateur-built, tail-wheel-equipped aircraft struck a large bump after touching down on the two main wheels on the short, rough, grass strip. The aircraft bounced and struck another bump. The left main gear began to collapse, and the pilot applied full power and opposite aileron and took off again. During the subsequent landing, when the aircraft's weight settled onto the wheels during the landing roll, the left gear then the right gear collapsed. The lower engine cowling, intake scoop, and propeller tips were damaged.

The weather at the time was 20 miles visibility in light haze, temperature 25 degrees Celsius. The wind was light from the south.

The pilot reported that a high approach speed on a rough, downsloping runway, combined with a series of hard bumps on landing in a tail-high attitude, overloaded the main gear on the initial landing.

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ATLANTIC ULTRALIGHT ASSOCIATION
BIRDMAN CHINOOK (Ultralight) C-ICHG
HARDWOOD LANDS, NOVA SCOTIA
16 AUGUST 1987

BRIEF NUMBER: 87-A75003 (Accident)
LOCAL TIME: 1145 ADT
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Commercial Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	260	27
LAST 90 DAYS	20	17

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot and student were practising touch-and-go landings on a grass airstrip. On the fifth landing, with the student at the controls, power was not applied soon enough to prevent an undershoot, and the aircraft touched down short of the strip. The right main wheel axle broke when the wheel hit a slight upslope. The pilot took control, and, during the subsequent forced landing, the aircraft sustained damage to the down tubes and left main wheel axle.

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BEAVER RX 550 (Ultralight) C-IHWR
PORT CARTIER, QUÉBEC
19 AUGUST 1987

BRIEF NUMBER: 87-Q75009 (Accident)
LOCAL TIME: 0755 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	210	210
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The purpose of this flight was to familiarize the passenger with this type of ultralight aircraft which was equipped with amphibious floats; training was to take place on a lake.

Immediately after lift-off from a 1,500-foot private airstrip, while at an altitude of about 300 feet above ground level, the pilot realized that the nose of the aircraft was heavy. He turned back in order to return and land eastward. Despite the pilot's efforts to pull as hard as possible on the controls, the aircraft descended quickly. The left wing struck the top of a tree, and the ultralight aircraft crashed short of the runway.

The floats had been installed for the first time on this aircraft just before the flight, without the use of relevant technical references. Because of the poor installation of the floats, the centre of gravity was too far forward.

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SYLVAIRE BUSHMASTER (Ultralight) C-ICBN
WINNIPEG LYNCREST AERODROME, MANITOBA
19 AUGUST 1987

BRIEF NUMBER: 87-C75003 (Accident)
LOCAL TIME: 1300 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Ultralight Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	63	50
LAST 90 DAYS	3	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The aircraft was on the cross-wind leg, at about 200 feet above ground, when the engine lost all power. The pilot carried out a forced landing, downwind, in a grain field adjacent to the runway. The aircraft was substantially damaged.

A flexible line between the fuel pump and the crankcase had collapsed, and the fuel pump ceased to operate. The engine then stopped because of fuel starvation.

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PALOS GABOR B8M (Gyroplane) C-GSJN
WESTLOCK, ALBERTA
19 AUGUST 1987

BRIEF NUMBER: 87-W70064 (Accident)
LOCAL TIME: 1615 MDT
OPERATION: Private Testing
DAMAGE: Substantial
PILOT LICENCE: Student Gyroplane

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	500	500
LAST 90 DAYS	10	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

A new rotor blade was installed on the gyroplane, which had been in storage for some time. The flight was to con-

firm that the aircraft was in a serviceable condition. The aircraft had taken off and was climbing through about 750 feet above ground level when the engine began to lose power. The pilot followed a road while an attempt was made to identify the problem, but the aircraft continued to lose altitude. The pilot force-landed the aircraft on the road in a 20-knot tail wind. During the flare, the rotor blade struck the road behind the gyroplane. The aircraft rolled onto its right side and slid a few feet before coming to a stop.

The pilot believed that there was varnish in the fuel which affected the engine's power output.

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TERRATORN TIERRA II (Ultralight) C-IEHD
LAC CARIBOU, QUEBEC
20 AUGUST 1987

BRIEF NUMBER: 87-Q75010 (Accident)
LOCAL TIME: 1945 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Student Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	25	25
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot and his passenger were returning from a local pleasure flight. Because the sun was setting, the pilot elected to overfly mountains en route to his destination instead of taking the longer route around the mountains. While over the mountains, the aircraft encountered severe turbulence, resulting in a loss of altitude and momentary aircraft stall. Rather than risk continued flight, the pilot carried out a forced landing on a small trail on a wooded mountain. During the landing, the aircraft sustained substantial damage. Neither the pilot nor his passenger was seriously injured.

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LAZAIR I (Ultralight) C-IGMC
MISSION, BRITISH COLUMBIA
21 AUGUST 1987

REPORT NUMBER: 87-P75006 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1350 PDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Student Pilot Permit

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	31	18
LAST 90 DAYS	11	7

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot took off from an ultralight strip along the King George Highway to locate, from the air, property suitable for the development of an ultralight airstrip. He landed at the Glen Valley strip, and, after spending about half an hour there, he took off for Yarrow, British Columbia. While overflying some properties to the northwest of Mission, British Columbia, the aircraft flew into a clump of trees, struck a residential power line with its right wing, and crashed to the ground in a nearly vertical attitude. The pilot was fatally injured, and the aircraft was destroyed in the post-crash fire.

The aircraft was a Lazair I with two wing-mounted engines. The pilot had worked on the right engine prior to this flight to reinstall a spring that holds the exhaust assembly together; the spring had come loose during a previous flight. No other failures or malfunctions had been reported. According to the pilot's hand book, the aircraft is capable of flight with one engine at full power, and the engines can be restarted in the air. To restart an engine, it is necessary for the pilot to lean forward, reach up toward the engine, and pull the starter rope down.

Examination of the left engine (a single-cylinder Rotax 185) revealed that its ignition cable, which normally slides into the spark plug protector located on top of the engine, was disconnected and showed heat damage from having lain on top of the hot engine. The lead is retained in the fitting by friction alone and has no means of securing it in place. It showed no signs of wear, and the reason why it was disconnected could not be determined. The damage to the left propeller showed that the left engine was stopped at the time of impact.

The area of the occurrence is gently sloped and clumps of trees break up the otherwise grassy surrounding. The

power line that the aircraft struck was below tree-top level and partially hidden from view.

It is believed that the pilot was flying low to have a closer look at a property, when the spark plug lead on the left engine became disconnected, and the left engine stopped. The pilot then lost control of the aircraft and, without sufficient height to recover, flew into the trees and struck the power line.

It is possible that the pilot attempted to restart the failed engine by pulling on the starter rope; this action would produce a forward shift in the centre of gravity and put the aircraft in a nose-down attitude at a time when the pilot was distracted by his attempt to restart the engine.

CONCLUSIONS:

Findings:
1. The left engine failed in flight when the spark plug lead became disconnected.

2. The pilot lost control of the aircraft following the engine failure.

3. The aircraft flew into trees and struck a residential power line.

4. The spark plug lead was held in place by friction only.

Causes:
The pilot lost control of the aircraft, when the left engine failed.

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VOLMER VJ22 SPORTSMAN C-GHPN
KELOWNA, BRITISH COLUMBIA
23 AUGUST 1987

REPORT NUMBER: 87-P70073 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1225 PDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,300	65
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot of the Volmer Sportsman was overflying a golf course at 1,000 feet above ground level (agl) and was attempting to contact Kelowna Tower for landing instructions, when the engine suddenly stopped. The pilot reported that, because his head-set shut out the engine noise and because of the noise on the radio, he did not hear the engine stop, and the aircraft lost about 500 feet before he realized that the engine had stopped. He attempted a restart and transmitted a MAYDAY to the Kelowna Tower to advise that he was landing on the golf course.

The aircraft was observed in a fairly steep descending glide as it circled over the golf course. At about 100 feet above the ground, the aircraft suddenly turned to the left and descended steeply to the ground, narrowly missing a stand of pine trees. The aircraft came to rest in a vertical position with the tail section broken off and thrown to the right side. The cockpit area had disintegrated, and the pilot was seriously injured.

At the time of this accident, there were no restrictions to ceiling or visibility, and the wind was light.

The pilot held a valid licence; he had built the aircraft and was familiar with all the aircraft systems. The aircraft was examined and found to have been serviceable prior to the accident.

The aircraft's fuel system consists of three fuel tanks, one in each wing and a main tank in the centre fuselage section. Both wing tanks gravity fed into the center main tank through a fuel selector valve marked LEFT, RIGHT, and OFF, and fuel was fed to the engine from the main tank. Fuel pressure was provided by the engine-driven fuel pump, supplemented as required by an auxiliary electric boost pump. The left wing tank leaked and, for this reason, was not being used. The pilot normally flew with the fuel selector in the OFF position until the main tank was depleted to about the one-quarter level; he would then select the right wing tank to replenish the main tank. After the accident, the pilot could not remember having selected the fuel to the right tank.

After the crash, it was found that the fuel selector was selected to the right tank which contained several gallons of fuel; the centre main tank contained approximately one and one-half litres of fuel, and the left wing tank was empty. The fuel boost pump was found in the OFF position, and, when tested, it operated normally.

After it struck the ground, the aircraft came to rest in a vertical position. The main fuel tank, located at the rear of the cockpit, was torn loose and thrown forward onto the ground. The fuel lines joining the right wing tank with the main tank remained attached to the fuselage

above both tanks, which prevented fuel flow between tanks after the accident. The fuel selector and all fuel lines remained intact and were free of obstructions.

The engine was removed and tested. It started readily and performed according to specifications; the engine was then stopped, and it restarted easily while hot.

The evidence indicates that the engine stopped from fuel starvation when the main tank became depleted. When the pilot recognized that the engine had stopped, he selected the fuel to the right tank, and fuel began to drain into the centre tank. However, he had not switched the auxiliary fuel boost pump on, and, because of the aircraft's high rate of descent, the pilot was unable to restart the engine in the short time available before reaching the ground.

CONCLUSIONS:

Findings:
1. The pilot flew on the main fuel tank until it was empty, and the engine stopped from fuel starvation.

2. The pilot did not immediately realize that the engine had stopped.

3. The pilot did not switch on the boost pump when he attempted to restart the engine.

Causes:
The pilot allowed the fuel tank to run dry, and the engine stopped. He did not turn on the electric boost pump during the attempted restart. He was unable to restart the engine before the aircraft struck the ground.

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SPECTRUM BEAVER (Ultralight) C-ICFZ
UNION BAY, BRITISH COLUMBIA
31 AUGUST 1987

BRIEF NUMBER: 87-P75007 (Accident)
LOCAL TIME: 1917 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	658	10
LAST 90 DAYS	12	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The aircraft was cruising at about 800 feet above the ground, when the engine began to lose power. By opening and closing the throttle, the pilot managed to get three short bursts of power before the engine stopped completely, and he was committed to a forced landing.

The only available field in the area was sloped and had tall trees at one end and telephone poles at the other. The ultralight struck a small tree on approach and then landed heavily on the nosewheel. The cause of the power loss was not determined.

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SKY PILOT AVIATION INC.
SPECTRUM RX-35 BEAVER (Ultralight) C-IDLY
INDUS AIRPARK, ALBERTA
01 SEPTEMBER 1987

BRIEF NUMBER: 87-W75007 (Accident)
LOCAL TIME: 1000 MDT
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Student Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	15	1
LAST 90 DAYS	15	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The student pilot was on his first solo flight and was landing toward the west. On touchdown, the aircraft veered to the right, rolled along a taxiway, and came to rest after overrunning a ditch and a berm and striking a chain link fence. The pilot did not apply brakes during the occurrence. The wind on landing was from the left front at about five knots.

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ZENAIR CH107 (Amateur-built) C-GWUC
HUDSON HOPE, BRITISH COLUMBIA 10 mi E
03 SEPTEMBER 1987

BRIEF NUMBER: 87-W70057 (Accident)
LOCAL TIME: 1100 MST
OPERATION: Private Testing
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	737	0
LAST 90 DAYS	0	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was returning from a test flight on his recently constructed amateur-built aircraft. As the flaps were extended for landing, the aircraft commenced a descending left turn; the pilot attempted to stop the turn by applying full right rudder but was unsuccessful. He applied full engine power, and, as the aircraft was starting to climb, the right wing struck a tree and pivoted the aircraft into the trees. The pilot thinks that the aircraft turned because the airspeed was too low.

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SCHWEIZER SGS-2-33 (Glider) C-GCSK
ARNPRIOR, ONTARIO
05 SEPTEMBER 1987

BRIEF NUMBER: 87-O/70068 (Accident)
LOCAL TIME: 1406 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Glider

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	14	14
LAST 90 DAYS	2	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

While landing with a light left cross-wind, the glider bounced on touchdown and drifted right of the runway center line.

The glider then struck a tow aircraft which was parked on the side of the runway.

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THE BALLOON WORKS FIREFLY 7 C-GXSY
SUSSEX, NEW BRUNSWICK
06 SEPTEMBER 1987

REPORT NUMBER: 87-A70031
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0847 ADT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private Balloon

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	248	54
LAST 90 DAYS	37	37

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	1	1	-

HISTORY OF THE FLIGHT:

The balloon launched at 0715 Atlantic daylight time (ADT) in light winds and drifted easterly for five miles, during which time the pilot practised touch-and-go landings. The pilot decided to land in the Plumweseep area and prepared for an approach on an easterly heading into a field. As the balloon approached the boundary of the field, the gondola snagged on a set of high-tension power lines. Electricity arced about the gondola, which then began to burn. The three occupants jumped from the burning gondola to the ground, approximately 45 feet below; one occupant was fatally injured in the fall, and the other two received serious injuries.

The empty gondola was then dragged up and over the power lines and began to climb away. Three hundred feet east of the power lines, the gondola burned free of the balloon and fell to the ground; the gondola was totally destroyed by fire. The balloon continued to drift with the wind until it fell into the woods 10 miles east of the accident site.

PERTINENT INFORMATION:

The selected field was suitable in size, and the pilot had successfully landed there once during the previous summer. Near the field, there were two sets of power lines which had to be crossed when approaching on an easterly heading. The first set of power lines was 35 feet above ground; it ran at an angle of approximately 45 de-

grees to the balloon's direction of flight and crossed the approach path 800 feet from the threshold of the field. The second set of power lines, 55 feet above the ground, was at the threshold of the field, running at right angles to the approach and was obscured by trees from the pilot's view during the approach. The pilot did not see the second set of power lines. The physical evidence on the power lines showed that the gondola hit the second set of power lines while moving in an easterly direction.

When the pilot was sure that he would clear the power lines that he saw (the first set), he turned off the propane. As the balloon approached the field, a witness on the ground below the flight path shouted a warning to the occupants that the balloon was too low, as there were power lines ahead, and someone in the balloon, possibly a passenger, replied that they could not relight the burner. At this point, the pilot still could not see the second set of power lines.

At one time, the recommended procedure for fuel management on landing was to turn the fuel off just before touchdown in order to prevent the possibility of fire or explosion if the balloon did not remain upright on the landing. In recent years, it has been determined that it is safer to turn the fuel off after the balloon has touched down, so power is available in case of an emergency.

If a power line strike is unavoidable, the recommended procedure is to immediately turn the fuel off and pull the emergency air dump valve. The fuel is turned off to prevent the possibility of an explosion. The dump valve is pulled to increase the sink rate to try to avoid striking the wires. This procedure can result in a hard landing, but it is considered to be safer than striking the power lines. In this case, the pilot had already turned off the fuel, but he did not pull the emergeny air dump valve.

An aftercast of the weather indicated the existence of light wind shear in the area at the time of the accident; wind shear affects the lifting capability of a balloon and can cause a balloon's rate of descent to change unexpectedly.

When the balloon was recovered, it was inspected to determine its pre-impact condition; there was no evidence of pre-impact failure or of the balloon having burned.

ANALYSIS:

The second set of power lines was not visible to the pilot during the approach because the trees obscured his view; a retracing of the balloon's flight with a helicopter confirmed this fact. If the pilot did see the second set of power lines before hitting it, it was too late to take any emergency action.

If the burner had been operating, it is possible that avoidance action could have been taken from the point where the ground observer first warned the occupants of the power line ahead, but not from any closer. The pilot believed that there was only one set of power lines on the approach, those that crossed at 45 degrees, and, as he was sure he would clear them, he had already shut down the propane. There is further evidence that the pilot believed he had to cross only one set of power lines on the approach in that he took no other emergency action. If the pilot had seen the second set of wires, he could have pulled the emergency air dump release valve, but he did not do this even after he was alerted by the witness who shouted to them.

The pilot turned the propane off during the approach, contrary to recommended procedures; however, this, by chance, had the beneficial effect of reducing the danger of further injury or fire damage on impact.

It is possible that the balloon's rate of descent may have been increased by unexpected wind shear, in the absence of which, the gondola might have cleared the second power line, even though the pilot did not see it.

CONCLUSIONS:

Findings:

1. The balloon approached the landing field in a direction and at a height from which it was impossible for the pilot to see the second set of power lines.

2. The pilot was not using the recommended power management procedures and had shut off his burner before the landing.

3. A ground witness warned the occupants of power lines ahead.

4. The pilot, while aware of the first set of power lines, was unaware of the second set despite the ground warning.

5. The pilot did not see the second set of power lines in sufficient time to take any evasive action, such as pulling the emergency air dump release valve.

Causes:

The pilot did not see the power lines.

COTTRELL PAINE MARDON (Ultralight) C-IDAS
BENTONS AIRSTRIP, ONTARIO
07 SEPTEMBER 1987

BRIEF NUMBER: 87-O/75005 (Accident)
LOCAL TIME: 1400 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	300	30
LAST 90 DAYS	15	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

Prior to take-off, the pilot ran both engines for 5 to 10 minutes to ensure the fuel lines were clear of air bubbles, a common problem in the past. The aircraft took off and was approximately 50 feet above ground level when the left engine began to lose power. While he was attempting to restore power to the left engine, the pilot allowed the aircraft to yaw to the left and the airspeed to drop. He then began a left turn back to the airstrip. During this turn, the aircraft stalled and struck the ground. The pilot reported that the engine power loss was due to air bubbles in the fuel line and that, subsequent to the accident, the engine ran normally.

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SILVAIR BUSHMASTER (Ultralight) C-IEXJ
MAYERTHORPE, ALBERTA 3 mi W
08 SEPTEMBER 1987

REPORT NUMBER: 87-W75008 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1205 MDT
OPERATION: Private Other
DAMAGE: Substantial
PILOT LICENCE: Private Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	200	65
LAST 90 DAYS	60	60

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

Five minutes after the aircraft took off from the Mayerthorpe Airport, the engine (Rotax 503) began to lose power and then stopped. The pilot attempted to make a forced landing from low altitude, on a grain field. While turning at 15 feet above ground level, the aircraft stalled; it struck the ground heavily, skidded 20 feet, and then stopped.

Examination of the engine determined that a piston in the cylinder had seized, and there was evidence of heavy scuffing. Heat seizure of the piston caused the engine to stop; however, it could not be determined what caused the piston to overheat. The aircraft struck the ground in an out-of-control condition because the pilot did not maintain adequate flying speed and allowed the aircraft to stall.

There was a passenger on board the aircraft, which is contrary to regulations.

FINDINGS:

Cause Related:
1. The engine stopped because a piston seized.

2. The pilot did not maintain flying speed, and the aircraft stalled.

Other:
1. There was a passenger on board the aircraft, which is contrary to regulations.

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BUSHMASTER II (Ultralight) C-IDME
KING GEORGE ULTRALIGHT FIELD,
BRITISH COLUMBIA
19 SEPTEMBER 1987

REPORT NUMBER: 87-P75009 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1250 PDT
OPERATION: Private Demonstration
DAMAGE: Substantial
PILOT LICENCE: Commercial Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,200	5
LAST 90 DAYS	120	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	2	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The instructor and student pilot were on a local flight to demonstrate the ultralight aircraft, as the student was considering purchasing the aircraft. After about 20 minutes in the local area, they returned to land on the shorter of the two runways available. On short final, the instructor decided that he would use the longer runway and applied power to overshoot. The engine seemed to function normally, but the aircraft would not climb. The instructor turned the aircraft left about 90 degrees to avoid a power line and a highway overpass. On completion of this turn, he was faced with another power line that ran at right angles to the highway. Because the rate of climb was still extremely low and it appeared that the aircraft would strike the power line, the pilot applied left rudder and stalled the aircraft. It struck the ground and cartwheeled, coming to rest in an upright position. The engine and instrument panel were torn away, leaving the pilot and passenger seat exposed.

This ultralight aircraft was equipped with a 44 horsepower engine and was considered to be underpowered. The gross weight of the aircraft at the time of the accident was calculated to be 807 pounds.

The weather at the time of the accident was favourable for the flight, with scattered cloud and unlimited visibility. The temperature was 21 degrees Celsius.

The aircraft had minimum instrumentation; the airspeed indicator was not reliable as the needle pointed to 10 mph when the aircraft was stationary, and it fluctuated considerably in flight. There was no tachometer, so the pilot relied on the sound of the engine to tell if it was developing full power.

The wing loading at the time of the accident was close to the maximum recommended, thus it would have been very easy for the pilot to get behind the power curve. The instructor's limited experience on type, combined with an unreliable airspeed indicator, would have made it more difficult for him to recognize the situation.

CONCLUSIONS:

Findings:
1. The aircraft was considered to be underpowered.

2. The pilot had limited experience on type.

Causes:
The heavily laden and underpowered ultralight aircraft was not able to clear obstructions in its flight path.

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GEMINI HUMMINGBIRD GS1 (Ultralight) C-IADA SURREY, BRITISH COLUMBIA 20 SEPTEMBER 1987

REPORT NUMBER: 87-P75008 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1215 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,000	175
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The ultralight aircraft was in a turn at about 800 feet above the ground when the pilot heard a cable break. The aircraft continued to circle, losing altitude as the pilot tried to regain control by alternating power between the two engines. The aircraft then struck the ground in a nose-down, left-wing-low attitude, and the pilot was seriously injured. The pilot was wearing a helmet and shoulder harness at the time of the occurrence.

Examination of the aircraft control system revealed that the left wing aileron control cable had broken at the rear pulley. The Canadian Aviation Safety Board Engineering Laboratory determined that the cable had failed in fatigue. It was estimated that 50 to 60 per cent of the cross-sectional area of the cable had failed in a progressive fashion, weakening the cable to the point where it separated under normal flight loads. The cause of the fatigue failure could not be established. Once the cable broke, the aircraft was no longer controllable.

The pilot's use of a helmet and shoulder harness prevented more serious injury.

CONCLUSIONS:

Findings:
1. The left wing aileron cable broke at the rear pulley in a progressive manner as the result of fatigue.

2. The pilot's use of a helmet and shoulder harness prevented more serious injury.

Causes:
The left wing aileron control cable broke in flight.

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SCHWEIZER SGS2-33A (Glider) C-GIIB
HANOVER AIRPORT, ONTARIO
20 SEPTEMBER 1987

REPORT NUMBER: 87-O/70073 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1515 EDT
OPERATION: Private Training
DAMAGE: None
PILOT LICENCE: Glider

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,913	80
LAST 90 DAYS	45	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The student, accompanied by an instructor, was carrying out a simulated winch tow cable break at an altitude of 75 feet above the ground. Following the simulated break, the aircraft was in danger of overtaking and becoming entangled in the falling cable and parachute. The instructor told the student to open the spoilers to increase the rate of descent and avoid the cable. The aircraft continued to descend in this manner, and, during the flare to land, it struck the ground heavily. The aircraft was not damaged, but the instructor received back injuries.

The aircraft touched down with a high rate of descent in a flat attitude, touching simultaneously on the single main wheel and the skid. The student did not release the spoiler lever prior to the landing. On this type of aircraft, the spoilers should normally be retracted for landing.

The spoilers on this model aircraft are manually deployed by the pilot to increase the rate of descent. They are also deployed during the ground roll following touchdown; deployment of the spoilers at this time also activates the single-wheel brake which is interconnected with the spoiler control. The spoilers retract when the pilot removes his hand from the operating handle.

Because the landing was made with the spoilers open, the glider's wings lost lift prematurely, and the glider landed heavily. During the heavy landing, the instructor, who was in the rear seat sitting on a thick foam-filled cushion, received serious back injuries. Crashworthiness testing showed that, when subjected to a hard landing, a person seated on a foam-filled seat cushion of this type would experience double the G forces than when seated on a more rigid energy absorbing material.

The landing roll was extremely short which indicated that the aircraft was at a low forward speed and that the brake had been applied prior to touchdown.

CONCLUSIONS:

Findings:
1. The spoilers were kept open during the landing, resulting in a high vertical sink rate and a hard landing.

2. High vertical forces were generated during touchdown which resulted in serious back injury to the instructor who was in the back seat.

3. Laboratory tests carried out on the thick foam seat cushion indicated that G forces on landing would be doubled when using this cushion as opposed to a cushion made of more rigid energy absorbing material.

Causes:
The spoilers were open during the landing.

SAFETY ACTION:

Action Taken:
The glider operator, the Air Cadet League of Canada, has replaced the four-inch latex seat cushions in all its gliders, with seat cushions specifically designed for better energy absorbing characteristics.

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QUICKIE Q2 (Amateur-built) C-GRKF
WATERLOO-GUELPH REGIONAL AIRPORT, ONTARIO
25 SEPTEMBER 1987

BRIEF NUMBER: 87-O/70070 (Accident)
LOCAL TIME: 1820 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	115	45
LAST 90 DAYS	38	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was landing on runway 32 following a local flight. After touchdown, a gust of wind caused the aircraft to become airborne; the aircraft then struck the runway a second time in a nose-down attitude. The rotating propeller struck the runway and broke. The aircraft veered to the right, off the edge of the runway where it struck a runway edge light, damaging the right canard.

The wind was from the northwest, gusting to 10 knots at the time of the accident.

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AMERICAN AIRCRAFT FALCON (Ultralight) C-IDMV VIMY, ALBERTA 3 mi E 27 SEPTEMBER 1987

BRIEF NUMBER: 87-W75009 (Accident)
LOCAL TIME: 1925 MDT
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Student Pilot

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	20	20
LAST 90 DAYS	6	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot had been practising touch-and-go circuits for one and one-half hours. He was on final approach at an altitude of 300 feet when the engine suddenly lost power. An attempt to restart the engine was unsuccessful, and the pilot realized he was going to undershoot the runway. Traffic on a road crossing the approach to the runway forced him to turn left to attempt a landing in a field. The aircraft had insufficient speed to clear a 10-foot shrub on the approach. The aircraft stalled, nosed down onto the ground, and went over onto its back.

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DRAGONFLY (Amateur-built) C-GGQB WINDSOR AIRPORT, ONTARIO 28 SEPTEMBER 1987

REPORT NUMBER: 87-O/70074 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1710 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,500	1
LAST 90 DAYS	60	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The canard-type amateur-built aircraft had been recently completed and was on its first test flight. The pilot reported that the engine (Hagi 60-2 DM) ran rough during the taxi, but he decided to go ahead with the flight. After take-off, the engine problem worsened, and the control stick had to be held to its aft limit for the aircraft to maintain a 500-foot-per-minute rate of climb. As the airspeed increased, the aircraft tended to pitch nose-down and roll to the left. To maintain a level attitude, the control stick was held aft and to the right. The pilot completed the circuit and, during the approach, reduced the power, at which time the engine stopped. The aircraft struck the ground just short of the runway, causing the landing gear to collapse on the rough terrain.

The aircraft's engine was equipped with a POSA carburettor, which has a tendency to make the engine run rich in the intermediate power range, even when the recommended mixture adjustments have been made. To prevent carbon buildup and fouling of the spark plugs and to ensure full power on take-off, it is common practice for pilots to vary the power setting while taxiing and, before take-off, to apply full power while leaning the mixture control to ensure that the plugs are clean of carbon. The pilot did not report having followed this procedure prior to take-off, and the exhaust and spark plugs were found to be covered with heavy carbon deposits after the accident.

When empty, the aircraft's centre of gravity (C of G) was mid-way between the forward and aft limits. The manufacturer suggested to the builders of the aircraft kit that the centre of gravity be between two thirds and three quarters of the permitted range aft of the forward limit to reduce the aircraft's nose-down tendency.

The flight controls were inspected after the accident, and they operated normally. There was no noticeable unevenness in the rigging of the elevators. The manufacturer stated that, because of the length of the elevators on this aircraft, a very slight angular difference between the elevators was sufficient to create a rolling motion when the control stick was in the neutral position.

As the ribs of the wings had been cut by hand, it is possible that the contours of the two wings were slightly different.

The pilot's flying experience was on conventional-type aircraft, and this was his first flight on an aircraft with a canard wing.

The accumulation of carbon on the spark plugs during the flight indicated that the mixture was excessively rich; this reduced their efficiency and resulted in the engine losing power on final approach when the throttle was retarded. The pilot had not followed the commonly used technique to clear the spark plugs. The pilot showed poor judgement in attempting the flight with a rough-running engine.

The difficulty in controlling the aircraft could have been due to the position of the C of G, misrigging of the control system, or discrepancies in the construction of the control system or control surfaces.

CONCLUSIONS:

Findings:

1. Carburettor design caused the fuel/air mixture to be too rich and resulted in the engine running rough and eventually stopping.

2. The pilot did not follow the normal technique to prevent the plugs being fouled.

3. The pilot showed poor judgement in attempting flight with a rough-running engine.

4. Aircraft control difficulties could have been due to the position of the C of G, aircraft construction, or misrigging of the control system, or any combination of these factors.

5. The pilot had no previous experience on type.

6. The combination of engine failure and nose-down tendency resulted in the aircraft contacting the ground short of the runway.

7. The landing gear collapsed on landing.

Cau[illegible]
The [illegible]t attempted a test flight despite a rough-running engine.

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BERGFALKE II (Glider) C-FIHC
ST-HONORÉ AIRPORT, QUÉBEC
02 OCTOBER 1987

REPORT NUMBER: 87-Q70046 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1137 EDT
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Glider

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	410	210
LAST 90 DAYS	8	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

The purpose of the winch-launched glider flight was to simulate a cable break, execute a 180-degree turn, and land downwind. On board were a student pilot and his instructor. The glider took off into wind from runway 10, and the instructor simulated the cable break at about 500 feet above ground level (agl). The student allowed the glider to descend straight ahead to 300 feet agl and, approximately three quarters of the way down the runway, started a right turn. During the turn, the instructor selected the spoilers out and instructed the student to lose altitude rapidly. The aircraft was on approach at approximately 250 feet agl, with a tail wind and with only half of the runway remaining. The instructor took control and decided to touch down as soon as possible. During the descent, the airspeed increased 10 knots above the recommended approach speed. The glider touched down with approximately 700 feet of runway remaining and bounced back into the air. It settled back down and rolled past the end of the runway where it struck some trees and was substantially damaged.

The runway is approximately 4,200 feet long, and high trees are located 100 feet past the end of runway 28. The wind at the time was blowing from 140 degrees at 5 to 10 knots.

After the simulated cable break, the student pilot initiated the 180-degree turn too early, and the instructor did not take immediate action to stop the turn. As a result,

the glider was established on final approach, with a tail wind, at a height which did not allow the instructor to complete the landing on the runway.

FINDINGS:

Cause Related:
1. The student pilot initiated the turn too early after the simulated cable break, and the instructor allowed the student error to progress beyond a safe recovery point.

2. The aircraft was too high on final approach and could not be stopped on the runway.

Other:
- Nil -

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GLASER DIRKS DG200/17 (Glider) C-GVRR
CHIPMAN, ALBERTA 1 mi N
03 OCTOBER 1987

BRIEF NUMBER: 87-W70067 (Accident)
LOCAL TIME: 1710 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Glider

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	200	21
LAST 90 DAYS	15	14

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was on his fourth flight of the day. He released from the tow aircraft two miles west of the airfield at about 2,000 feet agl, while flying in a rain shower. Because the performance of this glider model decreased rapidly in rain, the pilot decided to return immediately for a landing. The glider was low on downwind and turning final, and it undershot the runway, struck some trees, and landed in a slough.

The pilot had increased his airspeed to 65 knots to offset expected downdrafts and possible wind shear with the approach of the heavy rain shower. The wind was gusty and had increased in strength since the pilot's previous flight.

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LAZAIR (Ultralight) C-IDQR
BRANTFORD, ONTARIO 4 mi W
04 OCTOBER 1987

REPORT NUMBER: 87-O/75006 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1348 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	560	1
LAST 90 DAYS	25	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot, who had recently purchased the ultralight, had only one hour of taxiing practice on ultralights. He taxied to the end of the turf strip, turned into wind, and commenced the take-off run. The wind was approximately 270 degrees magnetic, gusting from 15 to 20 mph. Full power was applied to both engines, and, as the airspeed increased from 10 to 14 knots, the aircraft became airborne unexpectedly and began drifting to the right of the runway. At about 60 feet above ground level, the pilot lowered the nose and banked the aircraft to the left; the aircraft stalled and struck the ground in a left-wing-low, nose-down attitude. The pilot was seriously injured.

The aircraft flight manual recommends that the beginner pilot not attempt flight if the wind exceeds five mph and warns that, if the wind is gusting, the aircraft might become airborne sooner than anticipated.

The pilot had a private pilot's licence, and he mistakenly assumed that the ultralight would respond in the same manner as a light aircraft in gusting wind conditions. The pilot had received no ultralight instruction and, what he had learned, was from talking with local ultralight pilots. His confidence in his own abilities, combined with his eagerness to master a new aircraft, influenced him to attempt a flight in strong, gusty wind conditions that exceeded the manufacturer's recommended limitations for this aircraft. When the pilot banked the aircraft, it stalled, went out of control, and struck the ground.

CONCLUSIONS:

Findings:
1. The pilot had not received any formal flight instruction on ultralight aircraft.

2. The pilot had only one hour of taxiing practice on ultralight aircraft.

3. The flight was attempted in strong, gusty wind conditions that exceeded the manufacturer's recommended limitations for the aircraft.

Causes:
The pilot banked the aircraft too steeply and it stalled.

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BABY GREAT DA-1 (Amateur-built) C-GNKE
ESSEX, ONTARIO
04 OCTOBER 1987

REPORT NUMBER: 87-O/70075 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1604 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	400	2
LAST 90 DAYS	2	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft departed from the Windsor Airport on a local flight with the pilot as sole occupant. While the aircraft was in cruise, at a height of about 1,400 feet above ground level, the engine (Continental A65) lost power and stopped. The pilot immediately shut off the fuel, contacted the tower advising them of his position, and made an emergency landing in a farmer's field. The main landing gear struck the muddy ground first, and the aircraft pitched onto its nose and flipped over. The pilot released himself from the harness and crawled out from underneath the aircraft.

The aircraft had been refuelled to capacity prior to the flight. The inverted position of the aircraft after the accident allowed fuel to escape through the filler cap situated forward of the windscreen, and only a small amount was found in the fuel line from the firewall to the gascolator bowl.

After the accident, the engine was examined, and a ground run was completed; the engine was found to be capable of producing power. The exhaust system and the spark plugs contained a heavier than normal carbon buildup, but this was probably because the engine had been run at idle speed for a long period of time prior to the flight so that an idle rpm adjustment could be carried out.

A brass fitting that attached the main fuel line to the carburettor's steel fitting was found to be broken, and the engine ran normally when the fitting was replaced. However, the Canadian Aviation Safety Board Engineering Laboratory determined that the fuel fitting probably failed as a result of one-way bending overload during the impact, as there was with no evidence of fatigue.

The evidence available did not provide any explanation for the engine failure.

CONCLUSIONS:

Findings:
1. The engine stopped for undetermined reasons.

2. The pilot made a forced landing on a muddy field, and the aircraft came to rest in an inverted position.

Causes:
The aircraft engine stopped for undetermined reasons, and the pilot carried out a forced landing.

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BIRDMAN (Ultralight) UNREGISTERED
MERVIN, SASKATCHEWAN 6 mi NE
12 OCTOBER 1987

REPORT NUMBER: 87-C75004 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1700 CST
OPERATION: Private Recreational
DAMAGE: Sustantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	60	1
LAST 90 DAYS	.1	.1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The ultralight, a weight-shift model, was flying downwind at an altitude below 200 feet above ground level when an uncontrolled descent commenced. There was a direct tail wind at the time from 10 to 15 knots. The pilot was unable to change the attitude, and the aircraft struck the ground.

The pilot was not aware of the licensing requirements for ultralights, and the aircraft was not registered as required by air regulations. This was the pilot's first flight since 1983, and his private pilot licence, which was valid in 1983, had expired because he had not renewed the medical validation.

A combination of strong winds and a lack of recent flying experience resulted in the pilot's losing control of the ultralight.

CONCLUSIONS:

Findings:

1. When the pilot turned downwind, he lost control of the aircraft due to a combination of strong winds and a lack of recent flying experience.

2. The ultralight was not registered as required by air regulations.

3. The pilot's private licence medical validation had expired.

Causes:

The combination of strong winds and a lack of recent flying experience resulted in the pilot's losing control of the ultralight.

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PIONEER INTERNATIONAL FLIGHTSTAR (Ultralight) C-IFVR BROUGHAM, ONTARIO 3 mi N 12 OCTOBER 1987

BRIEF NUMBER: 87-O/75007 (Accident)
LOCAL TIME: 1100 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	120	32
LAST 90 DAYS	2	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot departed from a small grass strip heading south for a local flight. The wind was from the southwest at about five knots. The aircraft was at an altitude of about 100 to 150 feet above ground level, when the engine lost partial power, and the aircraft yawed to the left. To avoid a collision with power lines and a busy roadway, the pilot quickly lowered the nose then raised it. The aircraft struck the ground heavily in a nose-up, left-wing-low attitude.

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ZENITH 200 (Amateur-built) C-GQEH MIDLAND, ONTARIO 15 OCTOBER 1987

REPORT NUMBER: 87-O/70081 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1435 EDT
OPERATION: Private
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,000	6
LAST 90 DAYS	165	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

JODEL D-II (Amateur-built) C-FRFJ
BLACKPOOL, BRITISH COLUMBIA
17 OCTOBER 1987

BRIEF NUMBER: 87-P70092 (Accident)
LOCAL TIME: 1230 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,200	1,000
LAST 90 DAYS	20	-

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The flight instructor was familiarizing himself with the recently completed amateur-built aircraft in order to give dual flight instruction to the owner/builder. During the initial climb phase of a touch-and-go landing, the aircraft lost power, and the pilot executed a forced landing off the end of the runway; the duration of the flight was 55 minutes.

The flight instructor did not visually inspect the fuel tank to ensure sufficient fuel for the flight. Prior to start-up, the instructor recalled that the cockpit fuel indicator gauge registered slightly more than one-half full. He reported that, at the time of the loss of power, the cockpit fuel indicator gauge registered one-quarter full. The instructor did not know the total fuel capacity of the aircraft.

The fuel capacity of the aircraft is 24 U.S. gallons. The aircraft had not been fuelled to capacity for fuel gauge calibration as recommended by the designer of the aircraft.

Examination of the aircraft after the accident did not reveal any mechanical or structural deficiencies. The fuel system was found to be intact and serviceable and containing about four ounces of fuel. The pilot initiated the flight without checking the quantity of fuel on board, and the engine stopped because of fuel exhaustion.

CONCLUSIONS:

Findings:

1. The aircraft builder had not calibrated the fuel gauge, as recommended by the designer.

2. The pilot did not verify the amount of fuel on board.

3. The engine power stopped because of fuel exhaustion.

4. There were no mechanical or structural deficiencies found with the aircraft.

Causes:

The engine stopped because of fuel exhaustion.

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REPORTED CIRCUMSTANCES:

The pilot was practising touch-and-go landings on a private runway near Blackpool, British Columbia. The aircraft had just lifted off and was about 25 feet above ground level, when the engine lost power. The pilot switched the fuel tank selector from the rear tank to the front tank, but the engine did not restart. The pilot banked the aircraft to the left to avoid colliding with a power line, and the aircraft stalled and struck the ground with the left wing and nose; the pilot sustained minor injuries.

There were approximately two gallons of fuel in the rear tank and six gallons in the nose tank when the pilot took off, and he had been flying for about one hour when the engine stopped. The engine stopped because of fuel starvation.

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HAWKER HURRICANE 5/8 (Amateur-built)
C-GHHB
EDMONTON VILLENEUVE AIRPORT, ALBERTA
31 OCTOBER 1987

REPORT NUMBER: 87-W70072 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1621 MST
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	225	1
LAST 90 DAYS	10	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

This was the first flight for the pilot on his WW II 5/8-scale fighter aircraft that he had constructed. The aircraft had been flown locally and had logged 36 hours during the past two years. The pilot had flown three circuits and had intended to land alongside runway 08 on the fourth circuit. His approach speed for the landing was 90 mph. When rounding out for touchdown, the aircraft was in an excessively nose-high attitude. The pilot applied power and, at the same time, lowered the nose to put the aircraft in a normal attitude for landing. The aircraft landed heavily, causing the main gear to collapse and damaging the propeller; the aircraft then skidded 150 feet.

The Hawker is a single-seat aircraft which does not permit dual flight instruction. Prior to this flight, the pilot received 10 hours dual instruction on a Cessna 140 to become familiar with the handling characteristics of tail-wheel aircraft. He had also conducted ground taxi tests on the Hawker.

Forward visiblity in the Hawker is limited when the aircraft is in a nose-high attitude. On this landing, the pilot misjudged his height above the ground and, while flaring for touchdown, he attempted to correct the excessively nose-high attitude by applying power and lowering the nose to a normal landing attitude. The aircraft, which has very sensitive controls, was closer to the ground than the pilot realized, and, when he lowered the nose, he overcorrected, and the aircraft struck the ground heavily. The main gear collapsed as a result of the hard landing.

CONCLUSIONS:

Findings:
1. The pilot had no previous experience flying this type of aircraft.

2. The single-seat design of the aircraft did not permit dual flight instruction.

3. The pilot misjudged his height above the ground during landing and overcorrected from a nose-high attitude.

4. The hard landing caused the the main gear to collapse.

Causes:
On landing, the pilot misjudged his height above the ground, and, while correcting a nose-high attitude, he overcorrected to a nose-down attitude, causing the aircraft to strike the ground heavily.

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BEAVER RX-550 (Ultralight) C-IGYJ
BURLINGTON, ONTARIO
31 OCTOBER 1987

REPORT NUMBER: 87-O/75008 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1527 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	75	75
LAST 90 DAYS	25	25

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The two ultralights departed from an airfield near Cayuga, Ontario for a pleasure flight to a park near Burlington, Ontario. The pilot of the second ultralight was familiar with the landing area which was about 150 yards long, and his ultralight, equipped with wheel brakes, landed successfully. Witnesses observed the second ultralight touch down, then heard the pilot increase engine power, and saw the ultralight turn sharply to the right. The right turn continued for 360 degrees at low altitude with an angle of bank that approached 90 degrees. The right wing then struck the ground, and the aircraft crashed, resulting in serious injuries to the pilot.

The pilot of the first ultralight reported that the purpose of the flight was to visit a remote park where a radio control model aircraft club, of which he was a member, usually met on the weekends. The weather conditions that day were suitable for ultralight flying. Because the first ultralight had a smaller fuel capacity, the pilot had planned to land and refuel his ultralight to complete the return flight to Cayuga. He also reported that, prior to the flight, the pilot of the accident ultralight agreed that he would not land, but would circle overhead because he was not familiar with the landing area and his ultralight was not equipped with wheel brakes.

The ultralights were not equipped with radios. The pilot of the first ultralight reported that he was surprised to see the second ultralight attempting to land and tried with hand signals to stop the pilot from landing.

The accident pilot received serious head injuries during the accident and did not remember the flight or the accident. The ultralight was examined after the accident, and there were no indications of pre-impact mechanical or structural deficiencies.

Prior to departure, the pilots discussed the fact that the second ultralight was not equipped with wheel brakes which limited short-field landing performance and that the pilot was not familiar with the landing area. It was decided that this ultralight would not land en route; however, the pilot decided to attempt to land, for undetermined reasons. During the landing roll, the pilot rejected the landing attempt, added power, and made abrupt control inputs at a low altitude. The witnesses reported that the ultralight then banked to the right until the wings were almost vertical. The pilot did not input the proper flight control commands to overcome the aerodynamic and gravitational forces to prevent the collision with the ground, and the ultralight crashed.

CONCLUSIONS:

Findings:

1. The pilot attempted an unplanned landing.

2. The landing attempt was rejected.

3. The control inputs by the pilot after the rejected landing were abrupt and excessive.

4. The aircraft entered a steep turn and struck the ground.

5. Although the pilot was wearing a helmet, he received serious head injuries and did not remember the flight or the accident.

6. The aircraft and engine were mechanically sound prior to the impact.

Causes:

The pilot attempted to land the ultralight, which was not equipped with wheel brakes, in a short landing area with which he was not familiar.

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RAND KR1 C-GBYH
DRUMMONDVILLE, QUÉBEC
1 NOVEMBER 1987

BRIEF NUMBER: 87-Q70049 (Accident)
LOCAL TIME: 1040 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	136	35
LAST 90 DAYS	4	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was making a recreational flight and intended to land at Drummondville, Québec. During the landing on runway 06, the left wing lifted and the aircraft veered right. The pilot then applied full power and the right wing touched the ground, followed by the left wing. The pilot was unable to bring the aircraft under control, and it came to rest in a ditch to the right of the runway.

During the landing, the wind was blowing from 290 degrees and varied between five and eight knots. The asphalt runway is 4,000 feet long and 75 feet wide.

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NORDIC II (Ultralight) C-IIFU
JONQUIÈRE, QUÉBEC
08 NOVEMBER 1987

BRIEF NUMBER: 87-Q75011 (Accident)
LOCAL TIME: 1530 EST
OPERATION: Private (Test flight)
DAMAGE: Substantial
PILOT LICENCE: Commercial (Ultralight)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	400	-
LAST 90 DAYS	47	-

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The owner and builder of the ultralight had asked an experienced pilot to perform the first test flight. After doing a run-up, the pilot began a long take-off roll to test the reaction of the aircraft's controls before taking off. During the initial climb, the engine (Rotax 532) stalled. The pilot attempted to land, but he had to stretch his descent beyond the limits of the runway, because some people were standing at the end of it. The ultralight struck a power line in its path at low speed, and crashed to the ground.

On this type of engine, fuel is supplied by a vacuum pump. A rigid pipe should connect the pump to the engine. The rigid pipe had been replaced by a soft plastic pipe. During the climb, the heat released by the engine softened the plastic and the walls of the pipe collapsed under the suction force of the pump, which interrupted the fuel supply to the carburettor.

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STITTS SKYCOUPE SA7D CF-UCX
WATERLOO-GUELPH AIRPORT, ONTARIO
19 JANUARY 1988

REPORT NUMBER: 88-O/0022 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0941 EST
OPERATION: Private Testing
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	12,000	.5
LAST 90 DAYS	200	.5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot took off from runway 14 to fly one circuit; while in the circuit, he carried out two 360-degree turns. Another aircraft was on final approach to land on runway 14 when the accident aircraft was on the downwind leg of the circuit prior to final approach, so the pilot decided to make another 360-degree turn to increase the spacing. During this turn, the engine lost power, and the pilot carried out a forced landing on a sod field located off the approach end of runway 14. Just before touchdown, the aircraft's nosewheel struck a five-foot-high wooden fence on the edge of the field, causing the nose strut to collapse and damaging the cowling. The aircraft slid for 204 feet on the turf surface and came to rest in a nose-down attitude.

The aircraft's records indicated that the aircraft had been stored in a favourable environment for over 13 years since being damaged by a wind storm. During that time, the aircraft's single 16.6 Imperial gallon fuel tank contained only a few gallons of fuel. Water vapour in fuel tanks left empty or near empty over long periods of time condenses, and water collects inside the tank.

The aircraft had been repaired, and this was the first flight since the repair work had been completed. The pilot reported that he had drained the gascolator bowl prior to the flight.

Examination of the fuel system after the accident revealed that the gascolator bowl contained several ounces of water. The carburettor was removed and dismantled, and a considerable amount of water was found in the carburettor bowl in the area of the main jet. The ambient temperature at the time of the accident was minus two degrees Celsius. It is possible that the water froze as it entered the main jet of the carburettor when

the aircraft was airborne. Although the pilot had drained the gascolator bowl prior to the short flight, water in the fuel system caused the engine to lose power.

CONCLUSIONS:

Findings:
1. The aircraft had been stored for over 13 years with the fuel tank almost empty.

2. The aircraft's fuel system was contaminated with water, and the engine lost power.

3. During the forced landing, the aircraft struck a fence, and the nosewheel and lower cowling were damaged.

Causes:
The pilot did not ensure that the fuel was free of contamination.

Annex 1

List of Reports by Aircraft Manufacturer and Type

REPORT BY AIRCRAFT MANUFACTURER AND TYPE

MANUFACTURER	TYPE	REPORT NUMBER	PAGE
		W75009	218
AERONCA	11AC	Q70057	156
		W70087	96
	11CC	Q70035	117
	15	O70061	170
	7	O70078	135
		Q70051	146
AEROSPATLE	ASTAR	P70082	192
		Q80003	201
		Q80031	203
AIR COMMAND	532	W75006	206
BABY GT. L.		O70057	206
		O70075	221
BEAVER	RX550	O75008	224
		P75007	212
		Q75008	207
		Q75009	209
BEAVER RX35		W75007	212
BEECH	100	A74971	29
		W70070	38
	200	A74963	118
		O70905	149
	24R	W74144	153
	36	O80017	159
		P70908	126
	80	O80005	182
	MUSKET	P70070	120
BELL	204B	P70056	183
	206	A70028	203
		A70034	197
		A70037	200
		A80038	202
		C80007	202
		P70069	204
		P70075	186
		P70077	189
		P70093	196
		P70096	195
		Q70056	199
		W70051	184
		W70082	199
	214	P70089	194
	47	C74101	198
		O70076	193
		W70062	191
BELLANCA	SCOUT	O80041	181
	VIKING	C70073	128
BENSEN	GYRO	W70064	209
BIRDMAN	ATLAS	C75004	221

MANUFACTURER	TYPE	REPORT NUMBER	PAGE
BIRDMAN (cont'd)	CHINOO	A75003	208
BOEING	727200	H74901	33
		O74919	27
	737200	P80029	26
	747100	A74077	8
		W74102	3
	767200	A80014	20
		O74230	15
BR AEROSPCE	BA31	O74207	10
		O80036	103
BRITTNORMAN	BN2A	C70076	74
		C74072	74
		P70102	45
CANADAIR	CL44	A74991	5
CDN RAND	KR-1	Q70049	225
CESSNA	150	C70064	123
		C70084	141
		C70092	60
		C80009	158
		C80029	7
		C80030	63
		C80038	164
		C80040	63
		O80032	161
		O80050	105
		P80027	162
		Q80026	62
		W80036	108
	152	C70065	53
		O70056	52
		O70069	57
		O70086	89
		O70090	61
		Q70036	122
		Q70052	58
		Q74090	52
		W70060	73
	170	W70058	129
		W70084	156
	172	C70058	108
		C70060	66
		C70062	114
		C70069	172
		C70074	130
		C70080	135
		C70091	148
		O70062	121
		O70064	126
		O70067	72
		O70071	134
		O70079	180

MANUFACTURER	TYPE	REPORT NUMBER	PAGE
CESSNA (cont'd)		O70089	92
		P70059	112
		P70062	168
		P70097	146
		P80010	101
		Q70039	55
		Q70042	72
		Q70043	174
		W70055	121
		W70061	56
		W70074	60
		W70908	154
	175	C70079	132
	177	C70059	109
	180	P70063	169
		P70098	59
		P70100	153
		Q70031	167
		Q70903	178
		W70065	176
		W70066	134
		W70075	152
		W80035	162
	182	O70065	125
		O80035	161
		P70083	133
		Q70902	118
	185	C70070	29
		C70088	40
		C70908	181
		C74099	40
		C80002	97
		C80020	103
		C80028	105
		C80032	51
		O70060	67
		Q70037	171
		Q70040	171
		Q70041	174
		Q70058	96
		W70052	113
		W70068	77
		W70078	43
		W70079	44
		W70086	157
		W70907	143
		W74091	71
	206	C70087	39
		P70088	36
		P70906	167
		Q70033	167

MANUFACTURER	TYPE	REPORT NUMBER	PAGE
CESSNA (cont'd)		W70076	150
	207	W70054	28
		W80005	99
	210	C70089	144
		P70090	137
		P70801	154
	305	P70910	76
	310	C70066	123
	337	A70907	157
		C70077	31
	402	P80015	49
	414	P80028	162
	421	C70907	129
CHAMPION	402	P70058	111
	7ECA	C74081	132
		C80042	164
		P70057	110
		Q70032	166
CONVAIR	CV580	A74084	67
CURTISS-WRT	CW20	C80015	100
DEHAVND CAN	DHC-7	P74107	12
	DHC-8	A74088	9
		A80039	22
		O74219	13
	DHC2	C70057	64
		C70095	96
		C80045	51
		O70077	37
		P70074	71
		P70087	36
		P70091	79
		Q70045	35
		Q70053	88
		Q80009	97
		W70059	30
		W70083	44
	DHC3	C70082	57
		C74113	48
		C80036	106
		P70911	91
		P74088	28
	DHC4	W70073	83
DOUGLAS	B26	W74073	65
	DC1030	A74959	1
		O80023	21
	DC3	C80037	106
		W70063	75
	DC8 30	A74112	82
	DC9 30	A74100	32
		C74100	17
ERCO	415	O70084	142

MANUFACTURER	TYPE	REPORT NUMBER	PAGE
FIREFLY	FF7	A70031	213
GEMINI	HUMMIN	P75008	216
GLASER-DIRK	DG-200	W70067	220
GRUMMAN	G164	A70025	65
HAWKER-SDLY	HS125	W74122	145
	HS748	O74172	8
		O74261	18
HILLER ACFT	12	C70072	188
HOMEBUILT		O70058	205
HUGHES	500	C70090	198
		P70060	185
		P70068	185
		P70078	190
HURRICANE	SCALE	W70072	224
JODEL	D11	P70092	223
LAKE	LA4	A70029	172
		A80009	180
		P70054	165
MARDON 1		O75005	215
MOONEY	M20E	C74904	83
NA ROCKWELL	NA64	O70082	137
NORMAN AVN	NORDII	Q75011	226
PIONEER	FLTSTR	O75007	222
PIPER	CHEYEN	O70083	80
	J4	W70069	137
	PA11	C80016	160
		W70053	116
	PA12	Q70044	177
	PA18	A70026	110
		C70086	142
		C74068	68
		P70079	175
		P70080	131
		Q70047	179
	PA22CP	C70085	139
	PA23AZ	A70036	94
		P70072	69
		P70095	41
		P80003	99
		Q70054	89
		Q70055	42
		Q70801	78
	PA24	O80008	159
	PA24T	P70055	109
	PA25	C70067	123
	PA28	A70030	56
		A70905	151
		O70904	139
		P70067	118
		P70099	147
		Q70034	116

MANUFACTURER	TYPE	REPORT NUMBER	PAGE
PIPER (cont'd)	PA30	W70071	143
		W70085	60
	PA31	A74122	90
		P70101	91
		P74127	41
		P74145	48
	PA32	C70068	124
		P70907	125
	PA34	C70071	54
		O70072	133
		P70094	143
		P80017	61
		Q80014	100
POLISH ACFT	PZL104	P70085	134
	PZLM18	A70033	77
		O70063	72
QUAD CITY	CHALII	Q75006	205
QUICKIE	Q2	O70070	217
REPUBLIC	RC3	P70064	168
ROCKWELL	112	A70906	93
	690	A74089	70
	THRUSH	A70032	131
SCHEIBE	BERGFA	Q70046	219
SCHLEICHER	KA8	A70027	208
SCHWEIZER	SGS233	O70068	213
		O70073	217
SOVIET	IL62	A74992	6
STARDUSTER	TOO	O70059	208
STINSON	108	P70065	117
		W70056	54
		W80007	160
STITS	SA7D	O80022	226
SWEARINGEN	226TC	W80022	50
SYLVAIRE BU	SHMR	C75003	209
		P75009	215
		W75008	215
TAYLORCRAFT	B/B12	C80035	163
TERRATORN	TIERRA	Q75010	210
THURSTON	TSC1A	O70080	180
ULTRAFLIGHT	LAZAIR	O75006	220
		P75006	210
VIKING	DRAGON	O70074	218
VOLMER		P70073	211
ZENAIR	CH-701	W70057	213
ZENITH		P70071	122
	CH-200	O70081	222
	CH-250	O70088	155

Annex 2

List of Reports by Provinces/Territory of Occurrence

REPORTS BY PROVINCE/TERRITORY OF OCCURRENCES

PROVINCE/TERRITORY	DATE	REPORT NUMBER	PAGE
Alberta	87-07-30	W70051	184
	87-08-18	W70055	121
	87-08-19	W70064	209
	87-08-23	W70056	54
	87-09-01	W75007	212
	87-09-05	W70058	129
	87-09-05	W70059	30
	87-09-07	W70060	73
	87-09-08	W75008	215
	87-09-10	W70061	56
	87-09-16	W70062	191
	87-09-26	W70065	176
	87-09-27	W75009	218
	87-10-03	W70067	220
	87-10-11	W70069	137
	87-10-26	W70070	38
	87-10-31	W70071	143
	87-10-31	W70072	224
	87-11-03	W70907	143
	87-11-09	W74122	145
	87-11-15	W70074	60
	87-11-22	W70075	152
	87-11-22	W70076	150
	87-11-27	W74144	153
	87-12-10	W70084	156
	87-12-13	W70085	60
	87-12-26	W70087	96
	87-12-28	W70086	157
	88-01-16	W80007	160
	88-02-18	W80035	162
	88-02-26	W80036	108
British Columbia	87-07-24	P70054	165
	87-07-26	P70055	109
	87-07-29	P70056	183
	87-07-29	P70057	110
	87-07-30	P70058	111
	87-07-30	P70059	112
	87-07-30	P70060	185
	87-07-31	P70906	167
	87-08-01	P70062	168
	87-08-01	W70052	113
	87-08-05	W70053	116
	87-08-06	P70063	169
	87-08-06	P70064	168
	87-08-07	P70068	185
	87-08-09	P70065	117
	87-08-09	P70067	118
	87-08-09	P74088	28
	87-08-14	P70069	204

PROVINCE/TERRITORY	DATE	REPORT NUMBER	PAGE
British Columbia (cont'd)	87-08-16	P70070	120
	87-08-20	P70071	122
	87-08-21	P75006	210
	87-08-22	P70072	69
	87-08-23	P70073	211
	87-08-23	P70074	71
	87-08-25	W74091	71
	87-08-27	P70907	125
	87-08-31	P70075	186
	87-08-31	P75007	212
	87-09-01	P70908	126
	87-09-03	W70057	213
	87-09-04	P70077	189
	87-09-07	P70078	190
	87-09-15	P70079	175
	87-09-19	P75009	215
	87-09-20	P70080	131
	87-09-20	P75008	216
	87-09-21	P70910	76
	87-09-26	P70082	192
	87-09-27	P70083	133
	87-09-29	P74107	12
	87-10-02	P70085	134
	87-10-05	P70087	36
	87-10-06	P70088	36
	87-10-10	P70091	79
	87-10-11	P70089	194
	87-10-11	P70090	137
	87-10-17	P70092	223
	87-10-21	P70096	195
	87-10-27	P70093	196
	87-11-01	P70094	143
	87-11-08	P70095	41
	87-11-10	P70097	146
	87-11-12	P70098	59
	87-11-15	P74127	41
	87-11-17	P70099	147
	87-11-22	P70911	91
	87-11-28	W70083	44
	87-11-29	P70100	153
	87-11-30	P70101	91
	87-12-04	P70102	45
	87-12-05	P70801	154
	87-12-18	P74145	48
	88-01-11	P80003	99
	88-01-24	P80010	101
	88-01-27	P80015	49
	88-01-29	P80017	61
	88-02-18	P80027	162
	88-02-20	P80028	162
	88-02-21	P80029	26

PROVINCE/TERRITORY	DATE	REPORT NUMBER	PAGE
Manitoba	87-07-27	C70059	109
	87-08-19	C75003	209
	87-08-21	C70065	53
	87-08-23	C70067	123
	87-09-01	C70072	188
	87-09-08	C74072	74
	87-09-09	C70076	74
	87-09-09	C70907	129
	87-09-22	C74081	132
	87-09-26	C70079	132
	87-10-25	C70085	139
	87-11-03	C70087	39
	87-11-04	C70088	40
	87-11-06	C74099	40
	87-11-19	C74101	198
	87-12-15	C70092	60
	87-12-16	C74113	48
	88-01-06	C80007	202
	88-01-15	C80015	100
	88-02-11	C80029	7
	88-02-17	C80032	51
	88-02-20	C80035	163
	88-02-22	C80040	63
	88-02-27	C80042	164
New Brunswick	87-07-27	A70025	65
	87-08-09	A70028	203
	87-08-12	A74084	67
	87-08-19	A74088	9
	87-09-01	A74971	29
	87-09-06	A70031	213
	87-09-15	A70032	131
	87-09-27	A70033	77
	87-11-21	A74122	90
	87-12-14	A70036	94
	88-01-09	A80009	180
Newfoundland & Labrador	87-08-12	A74963	118
	87-08-30	A70029	172
	87-09-01	A70030	56
	87-09-16	A74100	32
	87-10-31	A70034	197
	87-11-12	A74991	5
	87-11-15	A74992	6
	87-11-22	A70905	151
	87-12-06	A70906	93
	87-12-23	A70037	200
	87-12-27	A70907	157
	88-02-11	A80038	202
	88-02-14	A80039	22
Nova Scotia	87-07-28	A70026	110
	87-08-03	A70027	208
	87-08-05	A74959	1

PROVINCE/TERRITORY	DATE	REPORT NUMBER	PAGE
Nova Scotia (cont'd)	87-08-16	A75003	208
	87-08-23	A74089	70
NorthWest Territories	87-08-02	W75006	206
	87-08-10	W70054	28
	87-10-06	W70068	77
	87-10-09	W74102	3
	87-11-23	W70078	43
	87-11-25	W70079	44
	87-11-28	W70082	199
	88-02-04	W80022	50
Ontario	87-07-24	O74919	27
	87-07-25	C70057	64
	87-07-25	O70056	52
	87-07-31	O70058	205
	87-08-01	C70062	114
	87-08-01	O70057	206
	87-08-06	O70059	208
	87-08-07	O70060	67
	87-08-10	O74172	8
	87-08-13	O70061	170
	87-08-19	O70062	121
	87-08-21	C74068	68
	87-08-25	O70063	72
	87-08-28	C70070	29
	87-08-29	C70069	172
	87-08-29	O70064	126
	87-08-29	O70065	125
	87-09-03	O70067	72
	87-09-05	O70068	213
	87-09-07	O75005	215
	87-09-11	C70074	130
	87-09-11	O70069	57
	87-09-16	C70077	31
	87-09-20	O70073	217
	87-09-25	O70070	217
	87-09-26	O70072	133
	87-09-27	O70071	134
	87-09-28	O70074	218
	87-09-28	O74207	10
	87-10-04	O70075	221
	87-10-04	O75006	220
	87-10-05	O70076	193
	87-10-07	O74219	13
	87-10-09	O70077	37
	87-10-10	C70082	57
	87-10-10	O70078	135
	87-10-11	O70079	180
	87-10-11	O70080	180
	87-10-12	O75007	222
	87-10-15	O70081	222
	87-10-18	O70082	137

PROVINCE/TERRITORY	DATE	REPORT NUMBER	PAGE
Ontario (cont'd)	87-10-18	O70083	80
	87-10-20	O74230	15
	87-10-25	O70084	142
	87-10-25	O70904	139
	87-10-31	O75008	224
	87-11-10	C70090	198
	87-11-16	O70086	89
	87-11-20	C70091	148
	87-11-20	O70905	149
	87-12-05	O70089	92
	87-12-06	O70088	155
	87-12-12	O74261	18
	87-12-29	O70090	61
	88-01-03	C80002	97
	88-01-06	O80005	182
	88-01-10	O80008	159
	88-01-13	O80017	159
	88-01-17	C80016	160
	88-01-19	O80022	226
	88-01-19	O80023	21
	88-01-25	C80020	103
	88-01-26	O80032	161
	88-01-30	O80035	161
	88-01-30	O80036	103
	88-02-03	O80041	181
	88-02-12	O80050	105
	88-02-20	C80036	106
Québec	87-07-25	Q75006	205
	87-07-26	Q70031	167
	87-07-26	Q70032	166
	87-07-27	Q70033	167
	87-08-02	Q75008	207
	87-08-05	Q70034	116
	87-08-06	Q70035	117
	87-08-08	Q74090	52
	87-08-15	Q70902	118
	87-08-19	Q75009	209
	87-08-20	Q75010	210
	87-08-23	Q70036	122
	87-08-24	Q70037	171
	87-08-29	Q70039	55
	87-08-29	Q70040	171
	87-08-31	Q70041	174
	87-09-02	Q70043	174
	87-09-04	Q70042	72
	87-09-22	H74901	33
	87-09-27	Q70044	177
	87-09-29	Q70045	35
	87-09-30	Q70903	178
	87-10-02	Q70046	219
	87-10-04	Q70047	179

PROVINCE/TERRITORY	DATE	REPORT NUMBER	PAGE
Québec (cont'd)	87-10-08	Q70801	78
	87-10-22	A74112	82
	87-11-01	Q70049	225
	87-11-08	Q75011	226
	87-11-11	Q70051	146
	87-11-12	Q70052	58
	87-11-15	Q70053	88
	87-11-16	Q70054	89
	87-11-17	Q70055	42
	87-11-19	Q70056	199
	87-12-12	Q70057	156
	87-12-29	Q70058	96
	88-01-02	Q80003	201
	88-01-08	Q80009	97
	88-01-19	Q80014	100
	88-02-09	Q80026	62
	88-02-23	Q80031	203
Saskatchewan	87-07-25	C70058	108
	87-07-27	C70060	66
	87-08-02	C70908	181
	87-08-23	C70064	123
	87-08-23	C70066	123
	87-08-26	C70068	124
	87-08-28	C70071	54
	87-09-03	C70073	128
	87-10-04	C70080	135
	87-10-12	C75004	221
	87-10-25	C70084	141
	87-10-28	C70086	142
	87-11-01	C74904	83
	87-11-06	C70089	144
	87-11-13	C74100	17
	87-12-19	C70095	96
	88-01-08	C80009	158
	88-02-11	C80028	105
	88-02-12	C80030	63
	88-02-21	C80037	106
	88-02-22	C80038	164
	88-02-22	C80045	51
Yukon	87-07-25	A74077	8
	87-07-26	W74073	65
	87-09-18	W70063	75
	87-10-01	W70066	134
	87-11-10	W70073	83
	87-12-05	W70908	154
	88-01-14	A80014	20
	88-01-14	W80005	99